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The Road.*

Soon as I knew you gathered from all lands,
And that my cause was in your skilful hands,
My pulses gave one throb and, with a bound,
To be with you I quitted all my ground,
City and village, forest, hill and plain,
And, Phryne at the judgment once again,
My veil of dust hiding the fears you gave me,
Behold me at your feet, my masters! Save, oh save me!
Oh save me, when I wander o'er the plains
Or, 'twixt the hedges of the country lanes,
I stretch my arms beneath some leafy glade,
Heavy with sleep and flecked with sun and shade;
When like a serpent undulate I glide,
Trailing my white robe up the mountain's side;
When, drunk with light, for breezes fresh I look
And wind along beside some chattering brook;
When I plunge into chasms, sound the deeps,
Climb to the plateaux, mount the dizzy steeps;
Or when above the mountains, near the skies,
I spread new worlds before men's dazzled eyes!
For all the gifts on you I have bestowed,
Be my good doctor—save, oh save the Road!

My case is grave and needs swift remedy;
Never has greater peril threatened me—
True, as in France, so in all other climes,
Much have I suffered from most ancient times.
In days when, sometimes subject, sometimes free,
People met people in fierce enmity,
I bore the shock of many a battle train
Rushing to doubtful death or doubtful gain;
And, like some avalanche of myriad tons,
The murd'rous passage of the heavy guns.
Chanting the Marseillaise, thirsting for war,
A nation shod with sabots passed me o'er,
And the great Emperor, to spread his fame
Over a world which trembled at his name,
Compelled me to his will and, spurring fast,
Triumphant o'er my prostrate body passed.
Glory I've borne—a heavy load to bear!
And others too as heavy and less fair;
The clumsy cart, rumbling with jolt and jar
Has crushed my bosom, leaving many a scar;
Coach, post-chaise, and postilions in full cry,
Flayed my back sorely, as they galloped by.

The lumber wagon laid my sinews bare!
Yet I stood firm, defying wear and tear,
Even I thought to breathe with greater ease;
My toil, less burdensome, began to please.
No longer coach or post-chaise o'er me whirled,
I was forgot, abandoned by the world.
Rarely some cart with tranquil pace would creep
Me by, the lazy driver half asleep—
Nought else by day or night disturbed my rest,
Thus, by sweet *dolce far niente* blessed,
Thinking my woes forever passed away,
In a false calm I lived until one day—

    A terrible monster burst into sight,
    God knows from out of what hell 'twas cast.
    Sheathed all in iron, a thing of might,
    Swiftly it passes—it has passed!

    It has passed, with a fearsome hooting,
    Trail of smoke and a sudden glare,
    Like to some dazzling meteor shooting
    Over the highways of the air.

    Fast and furious, onward dashing
    Tow'rds an horizon which e'er shrinks back;
    Fiery bolts of lightning flashing
    Over an echoing thunder track!

And ah! for me it means a wound indeed,
My face is crushed, my sides their binding bleed,
Car after car make ever fresh attacks,
Till my macadam's nought but ruts and cracks.
My body thus commences to decay
And, into dust dissolving, floats away!
Must I then die?
                    No, no! For you are here;
With you to aid me I have nought to fear.
Science and genius are in you allied!
In your great wisdom I can well confide.
Quitting the beaten paths, you'll seek new ways
Towards the cure for which your suppliant prays,
Thresh out fresh doctrines, find the golden mean
And, to preserve the *route* avoid routine!

Your patient's at your feet, apply your skill,
Probe, sound, investigate me as you will,
And, to prevent the tortures of the past,
Perfect a work, my masters, that will last!
Do this, and grateful evermore will be
All travelers—nay, all humanity;
For 'tis the road that is the fertile way,
Where Life and Progress must forever stray;
Where, seeking space and beauty far and wide,
The tourist flings unnumbered miles aside,
And over hills and valleys sows the seed
Which shall bring forth abundance in our need!
And when at length you have achieved your aim,
Restored my health and strengthened all my frame;
When by your work you've made me proof to shock,
Fearless, invulnerable, firm as rock;
My youth renewed, and more than ever fair,
I'll sing your praise here, there and everywhere;
Beneath all skies, telling the joyful story,
At every cross-roads I'll proclaim your glory
On Touring Club sign-posts for all to see!

The surest road to Immortality!

◆

REVIEWS.

Sewage Purification from a German Viewpoint.

PRINCIPLES OF SEWAGE TREATMENT.—By Professor Dr. Dunbar, Director of the Hamburg State Hygienic Institute. Translated with the author's sanction, by H. T. Calvert, Ph.D., Chief Chemical Assistant, West Riding of Yorkshire Rivers Board. London, England: Charles Griffin & Co., Ltd. Philadelphia, Pa.: J. B. Lippincott Co. Cloth; 6¼ × 9 ins.; pp. 271; 147 illustrations, mostly in the text. $4.50, net.

Considering his limitations of plan and space, Dr. Dunbar has produced one of the best books, if not the best, on sewage treatment ever written. In his preface he takes pains to point out that, although his extended investigations of the subject had resulted in almost unlimited material, so that it would have been easier to compile a reference work than to present a brief exposition of principles, yet he concluded to write a "short book." He continues:

> I do not consider the time ripe for the publication of a work of reference, because the whole problem of sewage disposal is developing just now at such a rapid rate that opinions which have been held for a very long time are daily giving way in the face of newly-established facts.

The original preface is dated July, 1907. The translator's note was written in September, 1908. It states that Dr. Dunbar, in reading the proof of the English edition, made "some alterations and additions specially for this translation." Possibly this brings the book more nearly to date in some particulars than the original preface would indicate. It may be noted that Dr. Dunbar in his preface states that matter supplementary to his discussion, which had accumulated during the preparation and publication of his book, would appear in the "Gesundheits-Ingenieur."

The value of the book lies in its comprehensive and searching review of sewage treatment from its beginning until the date of writing, and is enhanced by the fact that the author deals with British and American ideas and experiences from an independent but very intelligent standpoint. In addition it brings to English readers information regarding German theory and practice, which is but little known to them. Much of this information is based on the experimental and practical work of the author.

The volume is divided into two parts. The first of these is historical. The second part deals with "The Present Position of Sewage Treatment." In the historical portion, the author takes up successively the growth of river pollution and efforts to restrain it by law, and the development of methods of sewage treatment. In Part II. the characteristics of sewage and the objects of purification works are briefly discussed. The author then discusses in considerable detail methods for removing (1) suspended matter and (2) putrescibility. Disinfection is next considered, and after that there are chapters on supervision of disposal works and on the utility and cost of different methods of treatment.

In his brief review of the growth of river pollution, the author makes it apparent that, serious as may be pollution in special cases elsewhere, yet compared with England, "Germany and all other countries are at present only just showing the first signs of approach" to river pollution.

Dr. Dunbar presents a keen analysis of British legislation on and attempts at control of the administration of sewage disposal. Thirty odd years ago the British Parliament passed some legislation which would be considered drastic even to-day, save for the fact that it was largely nullified by provisional exceptions in the statutes. Further nullification has resulted from endeavors of local authorities on whom has fallen the prosecution of breaches in the observance of the law. In addition, the Local Government Board, in whom has been vested the approval of plans for sewage-purification works, has contributed largely to retard the progress of rational sewage treatment, by its arbitrary methods and its ultraconservative attitude. On this point Dr. Dunbar says:

> This Board has exercised a somewhat fatal influence on the development of the problems of sewage disposal and river pollution down to very recent times, not for want of good intentions, but rather as a result of its bureaucratic constitution.

The insufficiency of legislation alone, and the need of expert central supervision in order to effectively control water pollution and secure proper operation of sewage works, are emphatically set forth by the author as follows:

> In England, then, during the last few decades, the

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*Translation of an anonymous poem recited by Mme. Bart at the Gala Performance given at the Comédie Francaise on Oct. 14, 1908, in honor of the First International Road Congress, Paris. Reprinted from "The First International Road Congress, Paris, 1908." By G. M. Harris and H. T. Wakelam. London: Wyman & Sons.

> conviction has been gaining ground that legislation alone will not achieve the required results in the purification of rivers, but that much more may be expected from the formation of a special authority consisting of experts in the various branches of the subject and occupying such a position as to command the sympathy of all parties. Such an authority should be free from bureaucratic influence, able to follow the technical and scientific advances made in the subject, and free to make its decisions, after judging each individual case on its merits.

Germany, like America, is favored with large rivers and there, as here, complications arise on account of the many interstate streams. The German Imperial Council of Health has general control of the pollution of interstate streams, although strictly speaking its powers are chiefly advisory. Streams other than interstate are under the jurisdiction of the state governments, and most of the state legislation on the subject is old. In Prussia, the largest of the German states, an Order of 1901 sets forth the attitude which the police authorities should take in dealing with water pollution. Owing to different local conditions in various provinces, general legislation was considered impossible. Consequently, the police authorities, in dealing with stream pollution, must take into account "local and economic conditions, and all the varied and opposing interests" (to quote from Dr. Dunbar), as well as "practical experience and the present position of science." The Order asserts, in effect, that "streams which are pure should be kept so, whilst those which are already polluted may be less strictly dealt with." In exercising their jurisdiction, the police authorities should be guided by the results of frequent inspections. The Royal Prussian Testing Institute, which was established in or about 1901, "was founded to collect all necessary scientific information upon which the action of the authorities [controlling stream pollution] could be based."

In summing up legislation, Dr. Dunbar says:

> Questions of legislation on the subject of river purification have been dealt with more thoroughly in Great Britain and Germany than in other countries, and both countries have come to approximately the same conclusions, as will have been gathered from the preceding pages. A detailed study of the efforts made in other countries would disclose no new facts and may therefore be omitted here.

In thus summarily disposing of the legislation of other countries than Great Britain and Germany, it seems to us that the author has deprived some of the American states of credit, and his readers of information, to which both are justly entitled. This is all the more notable an omission because of its striking contrast with the credit which he gives this country for its part in the development of the scientific methods and principles of sewage treatment.

The benefits which sometimes result from delay, and the need of caution in adopting new ways of treating sewage, are set forth in two interesting paragraphs, as follows:

> Undoubtedly the difficulties of sewage purification have been made an excuse for delay, not only by manufacturers, but also by many towns, in carrying out the requirements of supervising authorities. In some cases the supervising authorities have been too lenient, and it must be pleaded as their excuse that they have been patiently awaiting the perfection of methods of purification which it was hoped would yield better results at less cost to those who had the sewage to deal with. Such hopes were raised about 15 years ago by the introduction of artificial biological methods. The intolerable nuisances to which some of the English rivers gave rise caused the authorities to put down hundreds of works in which these methods were applied before they had stood the test of time. The condition of the German rivers allowed the authorities to adopt a more expectant attitude. The experience which has been gained in England by the expenditure of enormous sums of money will be to Germany's advantage, and it is to be hoped that Germany will not find it necessary to pay as dearly for experiments which often proved fruitless and which the position of affairs in England made absolutely necessary.
>
> The history of the development of methods of sewage treatment, which will be dealt with in the next chapter, shows that in no branch of science is it more necessary to be cautious in the adoption of new methods.

The chapter to which reference is made in the closing words of the paragraph last quoted is remarkable as a well-drawn perspective view of the "Rise and Development of Methods of Sewage Treatment." Early instances of sewage irrigation, a chasing after new and, as it invariably proved, useless agents for chemical precipitation and new systems of utilizing sewage sludge, and the valuable work of the various royal commissions on sewage disposal, are all concisely noted. In the same brief, clear way, places are assigned to the work of Sir Edward Frankland (1871), his intermittent-filtration disciple, Bailey Denton (1871 and later), the Massachusetts State Board of Health (1886, on), Santo Crimp (1892), Dibdin (with Crimp, and then in 1896 at Sutton), and Corbett of Salford (coincident with but independent of Dibdin). It is only fair to say that elsewhere in the book Dr. Dunbar gives Sir Alexander Binnie credit for putting both Crimp and Dibdin at work in accordance with suggestions derived, as Corbett got his, from the Massachusetts State Board of Health. It also may be noted, for the sake of historical completeness, that Stoddard is credited with having begun earlier than any of these, basing his work directly on Frankland. The septic tank is mentioned only incidentally in this chapter, owing, we presume, to the fact that the author has more particularly in mind the complete, or at least the finishing, processes of sewage treatment. It may be added that later on Dr. Dunbar speaks of Scott-Moncrieff's cultivation tanks at Ashstead (1891) as really septic tanks; also that he refers in various places to such early workers as Waring in this country, and Lowcock, Garfield and Ducat in England.

Germany, until within the past ten years or so, did little or no independent experimental work. But it antedated sewage irrigation on the Craigentinny Meadows at Edinburgh and the irrigation meadows at Ashburton and elsewhere in Devon, England, in the 18th and early 19th centuries, respectively, by the establishment of land irrigation on the part of the municipality of Bunzlau, Germany, *in the year* 1559.

The seemingly advanced position of the Prussian authorities in 1877, and the subsequent adoption of a more rational view of stream pollution and sewage treatment, with chief reliance placed on screening and sedimentation, or screening alone, are interestingly stated by the author as follows:

> In 1877 the Prussian authorities laid down the principle that the discharge of unpurified sewage into the streams was in all cases to be prohibited. In many cases the degree of purification which was required could not possibly be attained, and such impossible requirements have stood in the way of sanitary progress. It was only when von Pettenkofer agitated for the adoption of reasonable requirements that the authorities began to consider what was possible, and from that time sewage purification in Germany took a turn which was characteristic and different to the development of matters in England. Since chemical precipitation methods had availed little, and given rise to nuisances of all kinds, Germany turned to the perfecting of simple mechanical screening and sedimentation methods. Sedimentation was first introduced at Marburg, and, later, at many other places, including Cassel. The authorities have further relaxed their requirements, and have gone so far as to allow, in certain cases, the adoption of screening alone to remove the coarser suspended matters.

Passing to Part II., "The Present Position of Sewage Treatment," the author continues his broad and sane methods. Portions of this section are particularly valuable in making available to English readers for the first time a considerable amount of information on German devices, methods and experiments, and also in presenting a concise review of British and American ideas and practice from the German viewpoint.

In view of the recent marked attention given to screening by some engineers in the United States, the pages on sieves, gratings and screens will be examined with care and pleasure by American readers; all the more so because Germany has perhaps done more with screening than any other country. The Hamburg screening apparatus and Riensch's disk sieve deserve special mention.

The subject of grease extraction is treated briefly but helpfully. Some devices for this purpose are described. The author quotes approvingly John D. Watson, of Birmingham, to the effect that "the recovery of grease from town sewage should never be attempted with a view to financial success."

German sedimentation tanks and experiments are presented and discussed in an instructive way.

The septic tank receives a fairly proportionate amount of space, at the end of which its advantages and disadvantages are discriminatingly summarized. One of the conclusions here given may be quoted as follows:

> The sulphuretted hydrogen formed in the tanks attacks the cement. It is stated that this may be avoided by a proper selection of the building material and by allowing the works to stand long enough before being brought into operation.

In the long and instructive ch[illegible] r on "Methods for the Removal of Putrescib[illegible]," considerable space is devoted to th[illegible] rk of the Massachusetts State Board of [illegible] lth, and a splendid tribute is paid to th[illegible] body. This tribute is all the more notable [illegible] view of the scanty and often grudging recogn[illegible] given this work by some, though not all, [illegible] sh writers, often qualified by deprecatory st[illegible] ents to the general effect that the Lawren[illegible] xperiments have little practical value save t[illegible] nt the way for Englishmen to develop Englis[illegible] thods. Dr. Dunbar says:

> If Frankland's experiments are to [illegible] egarded as the basis of modern biological methods [illegible] wage treatment, they have really attained this p[illegible] on with the aid of the systematic and scientifically [illegible] ried out experiments of the Massachusetts State B[illegible] of Health. This Board has not been content with s[illegible] g the problem only so far as was necessary for Ma[illegible] usetts conditions, but has extended its experiment[illegible] as to make them of general importance and applicab[illegible] In Massachusetts the soil is almost everywhere po[illegible] and sandy, but the State Board has not restricted [illegible] to experiments with such soil; it has selected al[illegible] s of filtering material, has aimed at finding that [illegible] ch is most suitable, and in other ways has aimed at [illegible] reasing the efficiency of intermittent filtration. Th[illegible] xperiments have really formed the basis of so-called [illegible] tificial biological methods, with which we shall h[illegible] to deal in the succeeding section.

Further on, the author describ[illegible] "Practical Applications of the Lawrence Experiments," particularly at Brockton and Framingham, using both line cuts and half-tones by way of illustration. He also describes the "Lawrence Methods of Soil Examination."

The "Absorption or Colloidal Theory of Sewage Purification" is discussed in a few interesting pages, in connection with the broader question, How do filters remove organic matter from sewage? The author rejects mechanical filtration, or simple straining, and also chemical combination, as agents. He believes that absorption is the real agent of the process, and states that he reached this conclusion as early as 1897. It should be understood that the author makes his observations on the colloidal theory in the course of his discussion on land or intermittent filtration. He concludes this section as follows:

> As regards the removal of bacteria, I should place greater reliance on a carefully prepared and well-managed land filter [intermittent filter bed] than upon any irrigation area, or indeed upon any other method of sewage purification; for the artificial biological methods, to be next described, do not furnish any guarantee for the removal of pathogenic germs.

In taking up "Artificial Biological Methods," the author again begins with Massachusetts experiments. He draws "a distinction between natural and artificial biological methods by restricting the use of the word artificial to such filters as were constructed not of naturally occuring soil, but which were built up artificially." A second characteristic feature of artificial biological filters is their greater coarseness, which calls for different methods of sewage treatment. Of Dibdin's slate beds, Dr. Dunbar says in conclusion that Dibdin's reports "are very favorable, but the process does not appear to me to be rational."

Contact beds and percolating filters, and the means of controlling the flow to and from the contact beds and spreading the sewage over the percolating filters, are taken up at some length. Eleven pages are given to "The Hamburg Filters with Fine Surface Layer," developed by the author in and since 1901 and now in use by a number of institutional and municipal plants. This is apparently a percolating filter, but in its present form sewage is distributed over the surface of the filter by means of a covering of fine material to which the sewage is brought by channels.

Passing from his relatively long discussion of the removal of putrescibility, the author next takes up disinfection. The complete removal of pathogenic germs by filtration, he states, is impracticable. If disinfection be necessary in any case, it may "be best attained by chemical methods." Nothing for this purpose approaches chloride of lime in lowness of cost. It is not necessary to carry disinfection to the elimination of all B. coli. Coli tests with 1 c. c. of treating liquid are sufficient. Since chloride of lime does not penetrate solid matter readily, it is necessary to remove all matter in excess of 1 mm. in size. This may be effected by screens, sedimentation or chemical precipitation. The great advantage of screens is that they give the smallest amount of solid matter for separate disinfection. The only screen suitable for this purpose, Dr. Dunbar considers, is the Reinsch circular sieve, which is in operation in Dresden. By such screening, the amount of solid matter removed and requiring separate disinfection amounts to about 4 cu. ft. per 30,000 U. S. gals. The disinfection of septic tank effluents with chloride of lime has been found satisfactory.

The year-round disinfection of all sewage of towns will not give results, Dr. Dunbar believes, proportionate to the expense, nor would it accomplish more than could be achieved by bedside disinfection in cases of communicable disease. In Hamburg, since 1899, the authorities decide, on receiving notification of communicable diseases, whether or not the patient shall go to the hospital, where disinfection of all excreted matters is practised. If the decision is for home treatment, then disinfectants are provided by the state and delivered to the house by an official who gives instructions as to their use.

The final chapter deals briefly with the relative cost and utility of the various methods of treating sewage. It concludes with the following interesting prophecy relating to the 40,000 acres or so which Berlin has devoted to sewage farming:

> I do not doubt, for example, that many of us will live to see the day when Berlin will sell its irrigation farms for building purposes and construct artificial biological works in their place.

We have devoted a large amount of space to this book because of its great interest and value, and in the hopes of introducing it to a wide circle of English readers throughout the world. There is scarcely a page of the volume that does not bristle with interesting comment and valuable suggestion. In conclusion, we express what we believe will be the hope of many others, that before many years the author, having succeeded so remarkably well in presenting a bird's-eye view of the principles and practice of sewage treatment to-day, will undertake that complete work of reference which he mentions in his preface and for which he seems to be so well qualified.

Gas and Other Internal-Combustion Engines

Reviewed by **LIONEL S. MARKS**,[*] M. Am. Soc. M. E.

THE GAS ENGINE.—By Forest R. Jones. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth 5¾ × 9¼ ins.; pp. 447; 142 text illustrations and 30 tables. $4; English price, 17s., net.

THE INTERNAL COMBUSTION ENGINE.—Being a Text Book on Gas, Oil and Petrol Engines, for the Use of Students and Engineers. By H. E. Wimperis, Assoc. M. Inst. C. E., Assoc. M. Inst. E. E., Whitworth Scholar. New York: D. Van Nostrand Co. Cloth; 5½ × 8¾ ins.; pp. 326; 114 illustrations in the text. $3, net.

The scheme of Mr. Jones' book is unusual in several respects. The general consecutive order is stated by the author to be "descriptive, operative, testing for faults, theoretical, results of trials." The first two-thirds of the book are rather for the operator than for the student; it is not till near the end that pressure-volume diagrams are explained and gas-engine cycles considered. A very considerable body of practical operating experience is placed before the reader, though this experience appears to have been with automobile and other gasoline engines rather than with larger gas engines.

The first chapter, on types of motors, frequency, scavenging and reversing is confused in its arrangement. The author does better in dealing with operating and other details than in the more general parts of the subject. Here and elsewhere there is a curious but not very successful treatment of illustrations. The illustrations are for the most part distinctly good, but they are not related to the text. No direct reference is made to them; they are simply interspersed in the text at the proper places with descriptive matter attached in smaller type. Occasionally there are several consecutive pages devoted to illustrations and descriptive matter, the effect of which is to break up the text. Moreover, the number of illustrations is inadequate. There is not much use, in a book of this character, in including the old Otto and Langen, free-piston engine; there is no use at all in giving a somewhat elaborate description of its mechanical details unless a figure is also given. Similarly, many types of carbureter are described without illustration. Another unusual arrangement is in placing present-day practice at the beginning of the chapter and the "pioneer" or the "early and obsolete" constructions near the end.

The second chapter, on carburation, carburetters, preheating the charge, and fuel supply, suffers as already indicated from insufficient illustration. It shows also the failure of the author in philosophic arrangement of his matter. The first thing dealt with is the *primer* for a carbureter; and that before the carbureter itself has been described. No reference is made to the primer, which is shown in a figure two pages later, although such reference would have made the matter much more clear than the description of it as "a simple hand-operated arrangement" that does certain things.

When we come to the chapter on ignition the large practical experience of the author begins to show itself. The subject of wiring schemes is particularly well and comprehensively treated, and there is much of valuable, practical observation. Of the fifty pages in the chapter on governors and governing, twelve are used for unrelated illustrations and descriptive matter of one special engine. The pendulum governor, and hit-and-miss governing, which are described in much detail are not illustrated. All the known variations in hit-and-miss governing (some of which are what the naturalist would call "sports") are included, as well as the throttling, cut-off and other automatic methods; hand control by throttle and spark are also given an important place. A simple mathematical treatment gives the speed variation at various loads in make-and-break governing. The succeeding chapters on cooling the motor, lubrication, and disposal of exhaust gases, deal principally with the problems occurring in automobile practice.

We come now to the best part of the book, the chapters on starting and adjusting the motor, on setting or timing the valves and igniter, on troubles, remedies and repairs, and on cleaning. The author himself says that his "experience in training something more than a hundred men in the commercial operation of gas and oil engines has been fully convincing as to the need of complete instruction" in "the methods of locating and eliminating troubles." In the matter of starting, all the preliminary preparations, the actual operations in starting, and the adjustments after starting, are listed in complete detail, for each method of starting, and for a considerable number of types of motors; the finer adjustments of fuel supply and ignition for most satisfactory operation are gone into fully. The testing and adjustment of the timing, the author's experience as to the best timing of the valves of automobile engines, the effect of worn and loose parts on the timing are some of the matters of the next chapter. A well classified list of causes of troubles in gas engines occupies some four pages. As the author remarks, "very few of these troubles ever occur in connection with intelligent operation, ordinary care and good construction." Following the list of troubles are sections dealing with various symptoms of trouble, such as back-firing, misfiring, pounding, pre-ignition and other unusual or erratic behavior of the motor; in each case the probable diagnoses are listed. This is done so thoroughly as to cover almost all the possible happenings. The chapter on tests of the ignition system is full of useful, practical suggestions, covering all the usual types of ignition apparatus. Similarly, the chapter on tests for air and gas leaks and on the cleaning and general care of a motor are full of useful "wrinkles" for the operator. These excellent practical chapters are not merely a collection of rules or statements of what to do, but they go into some detail in the discussion of the causes of the various troubles and the reasons for the correponding precautions.

There is an unusually good collection of indicator cards from American gas and oil engines; in many cases several cards from one engine are given for the purpose of showing the effect on the card of some alteration in the running conditions. There is also excellent comment on these cards and an endeavor to explain the characteristics of cards showing peculiar features. The effect of local explosions in the indicator connections is well illustrated, and many examples are given of the use of weak spring cards for improving the valve setting and the other operating conditions. One can hardly accept the footnote of the author, in which, discussing explosion in a cylinder, he says that "theoretically, in a quiescent body of gas, the propagating flame moves out from the point of ignition with the same constant linear velocity in all directions." The effect of ignition of part of the mass is to compress, and raise the temperature, of the rest of the mass, and therefore to increase the rate of flame propagation continuously.

The remainder of the book deals with definitions of economy and efficiency, with the physical properties of gases, combustion and heat values, fuels and gas making, pressure-volume diagrams, theoretical heat cycles and results of trials, a chapter being devoted to each of these subjects. There is frequently an unnecessary departure from the usual nomenclature and symbols. Economy is defined as either fuel consumption per unit of power or as the heat value of the same quantity. The ratio of specific heats is written λ instead of γ; $\frac{1}{J}$ is written G instead of A; R is used instead of N for revolutions per minute. These aberrations in the use of symbols are to be deprecated; they lead to confusion and have no advantages.

It is good to see the use of volumetric specific heats finding its way into engineering textbooks, as it simplifies many gas-engine calculations. The discussion of higher and lower heat values is clear and adequate, but there does not seem to be any justification for the assumption of so low a value .24 for the mean specific heat of (imaginary) steam gas at atmospheric pressure, for the temperature range from 212° to 32° F.

In considering the effect of humidity of the air on the power of a gasoline engine the author has failed to realize that gasoline and water are partly miscible, and consequently that the partial pressure of the gasoline vapor depends on the partial pressure of the water vapor present; that is on the humidity of the air. The explanation which he gives is not correct.

The final chapters are in general adequate and suggestive, but are not as exhaustive as are the earlier practical chapters.

On the whole, this book is a useful contribution to gas-engine literature, but only from the operative standpoint. In that particular it occupies a place by itself.

Mr. Wimperis states in his introductory chapter that one of the chief reasons for the writing of his book is that it is now necessary to work out a new theory of gas engines. The old belief that the specific heats of gases are constant is definitely disproved by a considerable body of experimental evidence, but no serious attempt has been made so far to apply these experimental results to the elaboration of a more accurate gas-engine theory. It is to this task in particular that the author devotes himself. The need for a new theory has been recognized by engineers for many years and it has been generally accepted that the large differences between the theoretical and the observed values of the pressures and efficiencies are due as much to imperfections in the theory as to imperfections in the engine. The author in common with many others believes this difference to be due principally to the assumption of constant specific heats.

He first discusses the older explosion experiments of Dugald Clerk and of Grover, and compares their observed maximum explosion pressures with the pressures which he calculates on the assumption that Mallard and Le Chatelier's values of the specific heats are correct, due allowance being made also for the cooling during the explosion period. He shows a remarkable accordance between the observed and his calculated pressures in Clerk's experiment—but a considerable discrepancy in Grover's experiments. He then proceeds to examine critically Grover's results and methods. Grover's experiments showed that higher maximum pressures were obtained when products of combustion were substituted for part of the excess air in the combustion chamber. This peculiar result has puzzled many, because it has always been negatived by actual gas-engine experience. The author does valuable work in locating the special factor causing this result, and in laying for all time the ghost of this anomaly.

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A fairly comprehensive but uncritical statement is given of the results of the recent work on specific heats. The author in his own calculations assumes a linear relation between specific heats and temperatures, disregards the influence of pressure, and uses Mallard and Le Chatelier's values. These values are undoubtedly somewhat too high, but that does not affect the correctness of the formulas which he deduces, in which symbols only are used.

Much use is made in this book of the quantity $\frac{dH}{dV}$, the ratio of the heat added to the working substance, to its change of volume. Equations relating this quantity to the pressures, volumes and ratio of specific heats are obtained, on the assumption of variable specific heats, and the adiabatic equation is obtained by writing $\frac{dH}{dV} = 0$. A number of Burstall's tests are analyzed by the use of these equations, and the heat exchange to the working substance during the compression period is determined. The results of this analysis are of an unexpected nature; the gas is seen to loose heat at the beginning of the compression and to gain heat rapidly at the latter part of the compression. This leads the author to an investigation in which he comes to the conclusion that the observed results are due mainly to the heating effect of the hot face of the piston, which effect is particularly marked when the piston is near the end of its stroke, at which time there is a relatively thin "slab" of gas between it and the cylinder head. The experiments of Petavel on the emissivity of a hot platinum wire at high temperatures and pressures are used for confirming this conclusion.

The theoretical efficiency of the Otto cycle is deduced for variable specific heats and it is shown that there is not (as is sometimes stated) an upper limit to which that efficiency tends as the ratio of compression increases. It is also shown that with a given compression, the efficiency falls as the strength (or heating value) of the mixture decreases, and also as the specific heat of the mixture increases. The above, and other thermal and thermodynamic matters make up the first and the most important section of the book. There is much that is of interest and of value, much that is original and much that is suggestive. Van der Waal's equation for gases is examined, and there is deduced from it the conclusion that the specific heat at constant volume is a function of the temperature only. The calculation of the flow of heat through the cylinder walls is handled according to Fourier's theorem, but with a simplified treatment. The author plunges at once into a mathematical analysis of most of the phenomena which he discusses, but he does not demand a knowledge of more than elementary differential equations from his reader.

The second section takes up the gas engine and the gas producer. After general descriptive matter, two modern attempts at increasing efficiency are described: the water injection method, and Clerk's super-compression method. Then the author takes up the indicator and gives an elaborate mathematical analysis of the motion of the indicator piston for the purpose of determining the disturbance on the indicator card due to inertia effects. Some calculations are also given for fly-wheel effect and balancing. Gas producers, producer gas, blast furnace and coke oven gas are treated in a somewhat general manner in two chapters, most of the space being devoted to tests, costs, statistics and other general data.

The third and last section considers oil and petrol motors, and here again the treatment is rather general and discursive, with an occasional plunge into mathematical analysis, as in the case of the theory of jet carburetors. Besides matter descriptive of engines, carburetors and ignition apparatus, there is included the excellent report of the Fuels Committee of the Motor Union on alcohol, and the results of various experiments on the influence of the character of the spark on the power developed in automobile engines. The final chapter gives the results of experiments on the efficiency of petrol (gasoline) engines under various conditions (notably the effect of size), takes up the subjects of rating, the best compression ratio, the relation between the composition of the exhaust gases and the efficiency and certain other matters pertaining to automobiles. The subject matter of the last section is not particularly well arranged, but it contains the results of the important recent researches of Callendar, Hopkinson, Clerk, Watson and other English investigators of automobile engines.

The book is interesting throughout and is original, but it is not well adapted to the needs of a student who is taking up the subject for the first time. The author is interested in a few special problems and devotes most of his space to them; he has done valuable work in helping towards a more complete theory of the gas engine.

◆

Climate—and Man.

CLIMATE.—Considered Especially in Relation to Man. By Robert De Courcy Ward, Assistant Professor of Climatology in Harvard University. [The Science Series, Edited by Edward Lee Thorndike, Ph.D., and F. E. Beddard, M. A., F. R. S.] New York; G. P. Putnam's Sons. London, England: John Murray. Cloth; 5½ × 8½ ins.; pp. 372; 34 illustrations in the text. $2, net.

The briefest popular definition of climate is "average weather." More specific brief definitions are "the average condition of the atmosphere" and "geographical meteorology." In this volume, the author first takes up in considerable detail the climate of the world. He then considers the relation of climate to man and his works, although it should be noted that this is kept before the reader throughout. The classification in both sections (the division into sections is our own) is primarily by the three great zones—tropical, temperate and polar, but in addition the author deals with marine, coastal, mountain, desert and continental climates. Attention is given to the history of climatology and to classifications by various writers. The first section contains statistics and diagrams, but is not overburdened with them nor with scientific terms. The second part, on climate and man, is more readable than the first, which partakes more of the nature of work of reference.

The opening chapter of the second part of the book is on "The Hygiene of the Zones." It deals with climate in its more specific relations to health and disease—chiefly disease. In view of the author's mention of the mosquito as the agent in the spread of malaria and yellow fever it seems strange that he should say nothing whatever of the flea and its primary host the rat as the vehicle of the plague. Note may also be made of the following sentence regarding typhoid fever:

> The view formerly held regarding a connection between temperature and humidity and typhoid epidemics has now generally been abandoned.

This may be true of epidemic typhoid, if such a view was ever held, but as to the endemic occurrences of the disease the evidence of a direct relation between high temperatures and high typhoid rates seems to be increasing. We may observe, however, that it may yet be found that factors associated with high temperatures, rather than heat itself, are the real cause of high typhoid in the Southern United States. In this connection, and also because of its broader interest, the author's summing up of his chapter on "The Hygiene of the Zones" may be quoted:

> The old view concerning the para influence of
> climate upon health is being replace the view that
> good hygiene is of more importance climate alone.
> Medical science has done much to st out some dis-
> eases like smallpox, and it will in tim bably largely
> stamp out others, like malaria, or yel fever, or even
> tuberculosis and diphtheria. Man hi not climate,
> is being held responsible for the occu e of this or
> that disease or epidemic, for its dis on, and for
> the death rates resulting from it. Ma lowered the
> death rate from disease most wonderfu He can lower
> it still further. Vaccination for sma preventive
> inoculation for plague; antitoxin for heria; good
> food, pure air, and exercise for scurvy; ing swamps
> and pools and the use of mosquito ne for malaria;
> pure water for cholera, typhoid fever, dysentery,—
> these are but a few of the methods n mployed by
> man in his war against disease.
>
> The influence of climate is by no m to be dis-
> carded as of no account, for that it acts, many ways,
> both directly and indirectly, has been wn in this
> chapter. The newer view regarding the luence of a
> change of climate as a preventive, or re ive, is that
> a change of residence, habits, occupa food, is
> usually of more importance than the ch in atmos-
> pheric conditions. If pure air, good food edom from
> worry, time for rest, proper exercise, ou r life, and
> a congenial occupation are provided, ma bodily and
> mental ailments would yield to the treatment. Climate
> is to be considered, because it affects our bodily com-
> fort; it may be dull, rainy, and cheerl or bright,
> sunny, and exhilerating, it may tend to keep us in-
> doors, or it may tempt us to go out. Thus some cli-
> mates will naturally be avoided, and others sought out,
> and the choice of a suitable climate will depend upon
> the disease to be dealt with. As a recent writer has
> well said, climate may "play an important part in the
> curative process, but the climate of certain localities
> does not possess any peculiar properties which act as a
> specific on certain diseases."

The three chapters on "The Life of Man" * * * in the tropical, temperate and frigid zones are full of interest and contain many practical suggestions as to food, clothing, housing, agriculture and other industries.

The final chapter, on "Changes of Climate," reviews the popular and the scientific opinion and evidence on this mooted question. The conclusion is reached, as one would suppose, that

> there is as yet no sufficient warrant for believing in considerable *permanent changes over large areas.* * * * There are periodic oscillations of slight amount. An eleven-year period has been made out, with more or less certainty, for some of the meteorological elements, but it has been of no practical importance as yet. A 35-year period is less uncertain, but is nevertheless of considerable irregularity, and can not as yet be practically applied in forecasting. Longer periods are suggested, but not surely established. * * * Each generation lives through a part of one or two, or even three oscillations. A snapshot view of these oscillations makes them seem permanent. * * * It is now believed that oscillations of climate are limited in time, but occur over wide areas. Finally, it is clear that man, whether by reforestation or deforestation, by flooding a desert or draining a swamp, can produce no important or extended modifications of natural climate. This is governed by factors beyond human control.

The volume is a worthy addition to the valuable "Science Series" of which it is a part. It may be added that its author is the translator of a portion of the three-volume "Handbuch der Klimatologie," by Prof. Julius Kahn, of the University of Vienna (see this Supplement, Sept. 17, 1903), which work the present author describes as "the only comprehensive text-book of climatology," and to which he gives credit for much of the information presented in book under review.

◆

THE PROPER DISTRIBUTION OF EXPENSE BURDEN.—By A. Hamilton Church. New York: The Engineering Magazine. Cloth; 5 × 8 ins.; pp. 116. $1.

One could hardly wish a clearer or more suggestive little dissertation on the "unproductive expenditures" of a manufacturing organization. The author succeeds in showing quite conclusively how unsatisfactory are all methods of general averaging. To the reader who is fully aware of the importance of correct expense distribution, this showing will carry its own argument. For the benefit of the less informed reader, however, the author might profitably have given some direct illustrations of the unhealthy conditions which may prevail when the cost distribution among different classes of work is known only very imperfectly; this would have demonstrated, per contra, that the subject of proper cost finding is indeed vitally important, in spite of its discouraging complexity. Still, the author does attain this object in a measure, and sufficiently so to engage full interest for the special me[illegible] which he elaborates. This method or system [illegible]ht be described as involving (1) a group dis[illegible]tion of general shop expense computed on [illegible]basis of normal working, (2) a supplementa[illegible]pense allotment to each group correspondin[illegible] the time any given machine or element s[illegible] idle, and (3) a distribution of selling expe[illegible] by analyzing this into its elements and, for [illegible] element, weighting the several varieties o[illegible]tput according to estimated participation [illegible] that element.

◆

Metallurgy Condensed.

Reviewed by **BRADLEY STOUGHTON.***

METALLURGY.—A Condensed Treatise for the Use of College Students and Any Desiring a General Knowledge of the Subject. By Henry Wysor, Assistant Professor of Analytical Chemistry and Metallurgy in Lafayette College. Easton, Pa.: The Chemical Publishing Co. London, England: Williams & Norgate. Cloth; 6 × 9¼ ins.; pp. 308; 88 illustrations. $3.

This book was written in response to a need which the author had felt in his teaching work, and which is shared by many others in a like position, as indicated by previous volumes of a similar scope and by opinions freely expressed in prefaces and reviews. The desiderata are set forth here as follows:

> The ideal is the embodiment of the history, practice and philosophy of metallurgy in a single volume, admitting only such matter as is essential to the student.

Admirable as this little book is, the thought that most frequently comes to one who reads it is that the author has set up too large an ideal, which neither he nor anyone else can attain. One might discuss the essentials of the history and philosophy of metallurgy in one volume, if he would, but surely not of practice too. The nearest approach to such an accomplishment is Schnabel's standard Handbook, which occupies two large volumes, not including iron and steel. Roberts-Austen, in his classical Introduction to the Study of Metallurgy, from which Mr. Wysor has with due acknowledgment freely drawn, includes the essentials of the history and philosophy of metallurgy in one good-sized book, but does not attempt to treat practice except occasionally for illustration. If one should endeavor to combine the essential principles discussed by these two authorities, together with something on iron and steel metallurgy, into one volume, one part at least would necessarily suffer, although even then the author may feel just pride if the result does not approach his own ideal. In the case of the book under consideration what suffers most is the philosophy of the science, and the art of extracting all the metals except iron and steel—especially of gold and silver.

The first chapter contains nine pages on the physical properties of metals, and this, as well as the six pages of Chapter 2, on refractory materials and fluxes, and the seven pages of Chapter 3, on thermal measurements, is a welcome addition to metallurgical literature when embraced in a general manual. The same may be said of Chapters 4 and 5, covering 22 pages altogether, on the subject of natural and artificial fuels. Chapter 6 has ten pages of text and 16 of illustration-space devoted to ore-dressing, under which head crushing occupies here the chief amount of attention, while the concentrating processes mentioned are jigs, frue vanner and Wetherill magnetic separator.

A discussion of metallurgical extraction begins with Chapter 7 (five pages) on furnaces, where mention is made of kilns, blast furnaces, forgers, reverberatories, muffle, crucible, and retort furnaces, electric and regenerative furnaces. Chapter 8 contains eleven pages devoted to the ores and properties of iron and steel, including the alloy steels, and Chapter 9 has seven pages on the chemistry of the iron blast furnace process. In both of these sections the author departs somewhat from the theories maintained by his predecessors. In the following chapter (23 pages), the operations and apparatus for iron smelting are described in a very good manner. Throughout the book the subject matter is clearly and forcibly presented and the illustrations are well chosen and well produced, but this is particularly true of the chapters on iron and steel. There then follow ten pages on iron foundry practice, nine on the history and process for the manufacture of wrought iron, six on the cementation and crucible process and eight on the Bessemer process. Chapter 15 (13 pages), on the acid and basic open hearth process is one of the best in the book. On the debated question of the relative superiority of acid and basic open-hearth steel, the author places his testimony on the side of those who favor the basic product. The last chapter on iron and steel contains eleven pages devoted to mechanical and heat treatment which are clearly written and well illustrated. One statement, however, seems to deserve revision. In speaking of the recalescence of steel, the author says that it is due to some change which the carbon and iron undergo, "not fully understood." This statement is not quite just to the researches of Osmond, Roberts-Austen, Arnold and others which have done so much to elucidate this subject. There may still exist a difference of opinion as to the allotropic modifications of iron, but no one denies, so far as the reviewer is informed, that the recalescence at about 700° C. comes from the separation of the carbon from a part of the iron and the formation of cementite.

The section on copper contains over 30 pages of text and several pages of illustrations. The wet processes and pyritic smelting receive little attention, and the chief emphasis is placed on reverberatory and ordinary blast furnace smelting. The subject of mechanical roasters is treated very briefly. Lead smelting occupies 13 pages and its refining, seven more. Zinc, tin and mercury are treated briefly, and then follow about 12 pages each on silver and gold, and nine altogether on nickel, aluminum, manganese and the rarer metals. It is probable that the relative unimportance of the metallurgy of the nonferrous metals in the locality where the author is a teacher has led him to slight them a little in space, and this is no doubt agreeable, not only to his own circumstances, but also to those of others in a like situation, but would be regretted by teachers whose students were drawn chiefly from the west and middle west. The final chapter, on alloys, is good as far as it goes, but, unfortunately, does not include the physical-chemical theory which is now believed to be the scientific basis of the subject.

Every addition to metallurgical literature which consists of the publication of the lectures of teachers of high standing such as this one is serviceable, and Mr. Wysor is to be congratulated upon the result of his efforts. We think that all will be ready and glad to commend the clear and interesting manner in which the data are presented, and the generosity which has led to the extra labor of putting his lectures in a form where they will be available to a still larger circle of students.

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*Consulting Metallurgist in Iron and Steel Work, 165 Broadway, New York.

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A BRIEF COURSE IN ELEMENTARY DYNAMICS FOR STUDENTS OF ENGINEERING.—By Ervin S. Ferry, Professor of Physics in Purdue University. New York: The Macmillan Co. Cloth; 5½ × 8¾ ins.; pp. 182; 121 illustrations in the text. $1.25, net.

Since the merits or demerits of a text-book, when administered by a teacher, are as nothing beside the influence of the teacher himself, we can judge Ferry's "Elementary Dynamics" only on the score of its utility for individual study. In this aspect, it is satisfactory in order of treatment and in argument, generally clear in both definitions and statements of observed fact, and sufficiently complete to give a good groundwork for fuller study in a larger book. The inclusion of "Properties of Materials" and a few other items is no doubt chargeable to the author's being interested in physics and not engineering, but it is by no means a harmful inclusion. A few very unconvincing statements, or awkwardly put definitions, contrast with the clearness and accuracy of the most of the text. To compensate for this, there are several very effective demonstrations and illustrations, not found in current text-books.

HAND-BOOK OF TIMBER PRESERVATION.—Souvenir Edition; Revised. By Samuel M. Rowe, M. Am. Soc. C. E. Chicago, Ill.: The Author (Monadnock Block). Leather; 4 × 6½ ins.; pp. 402; illustrated. $5.

This latest edition has about 74 pages of new matter, the first part of the book remaining practically unchanged. The new material includes reprints of letters from Engineering News, notes on tests of specimens of treatment timber (published in Eng. News, Sept. 24, 1908, by permission of Mr. Rowe), and tables of the absorbent properties of timber. There are also records of tie renewals, notes on specifications for paving with creosoted blocks, and notes on the open-tank system of treatment. The original part of the book deals with the properties of timbers, the methods of preservative treatment, and the design of treating plants. There are numerous tables and diagrams, with line drawings and half-tone engravings of treating plants.

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WHO MAKES WHAT.—A Book of Reference for Buyers [of Hardware, etc]. New York: Daniel T. Mallett. Stiff paper, with cloth back; 7 × 10 ins.; pp. 367.

We have here a very useful directory of the hardware trade. Part I. is a historical and descriptive geographical directory of wholesale merchants. Part II. is an alphabetic-geographic list of manufacturers, giving names only, but followed by index figures which refer to the next section. Part III., "Products and Goods," is an alphabetic list of all the goods made by the firms listed in Part II., with number references back to that part. Part IV. consists of responses to letters to U. S. Consuls throughout the world, asking the names of the leading hardware dealers in their jurisdiction. An index by cities is given. Part V. is a Directory of Exporters, alphabetically arranged by names of the individuals or companies.

◆

THE LOCAL GOVERNMENT BOARD (London).—Annual Report, 1906-07. Supplement Containing the Report of the Medical Officer for 1906-07. (Arthur Newsholme, Medical Officer.) London, England: Wyman & Sons. Paper; 6 × 9½ ins.; pp. xix. + 321; folding and other plates, and text illustrations. 1s. 6d.; American price, 60 cts.

We commend some portions of this report to the attention of those American municipal reformers who are continually pointing to British municipal administration as a model of all that is good. (See the latter part of the editorial article in the body of this week's issue.)

Aside from many interesting abstracts of local inspections of sanitary conditions and of the excessive prevalence of various communicable diseases, the volume before us contains an account of the routine work of the Chief Medical Officer for the year, and a number of special studies of technical questions. Among the latter is a "Report on the Micro-Organisms Present in Sewer Air and in the Air of Drains," by F. W. Andrewes, M. D. Recent investigations by Dr. Andrewes lead him to qualify the earlier conclusions at which he arrived in conjunction with Dr. Laws. He now states that

> the view, till recently current, that sewage does not readily give up its bacteria to sewer air is shown to be incorrect. The evidence is of more than one kind, and it all points in the same direction.

In this conclusion he agrees in general terms with deductions drawn by Major Horrocks, from studies which he made at Gibraltar and which he published a few years ago in the Journal of the Royal Sanitary Institute.

Lest any one be alarmed at these conclusions, it may be added that a detailed study of what both Dr. Andrewes and Major Horrocks have written on the subject does not seem to warrant any great anxiety on the part of those who believe that the dangers of the conveyance of pathogenic germs through sewer air are very small indeed.

◆

MASSACHUSETTS GAS AND ELECTRIC LIGHT COMMISSIONERS.—Report for 1908. Boston, Mass.: Pub. Doc. Paper; 6 × 9 ins.; pp. 660.

The usual valuable statistics on the operation of private and municipal gas and electric light plants are contained in this (24th) annual report. Included with the reports of action taken on petitions for reduction of lighting rates is a particularly valuable report on the rates and regulations of the Edison Electric Illuminating Co., which supplies Boston and vicinity.

An Interesting Contribution to River Hydraulics.

Reviewed by C. E. GRUNSKY,* M. Am. Soc. C. E.

LA FORME DU LIT DES RIVIERES A FOND MOBILE. —By L. Fargue. (Part of "Encyclopédie des Travaux Publics," begun by M.-C. Lechalas.) Paris, France: Gauthier-Villars. Paper; 6½ × 10 ins.; pp. 187; 50 illustrations, partly in the text. 9 francs; American price, $2.70.

In this monograph the author discusses his observations on the river Garonne, France, and a series of experiments on a small artificial channel, at Bordeaux, which was devised for the purpose of testing deductions from his earlier studies on the Garonne. The observations on the Garonne were first published by the author in Annales des Ponts et Chaussées in 1868. For 45 years after his work on the Garonne began (1863), he devoted much time to the studies of certain phenomena relating to the configuration of the channel of streams whose beds are formed of movable material, such as sand and gravel. The results of these studies are here presented in comprehensive form. The studies on the Garonne covered a channel length of 22 kilometers extending from Gironde to Barsac. Throughout this section the river had already been fixed in alinement by controlling works which in the course of the preceding twenty years had given the channel a prescribed location. The bed of the river throughout this section is sand and gravel. The rock-faced banks rise to about 2 meters above the low-water stage. The low-water flow of the Garonne is here about 3,000 sec.-ft. Its mean discharge is about 24,500 sec.-ft. The location of the shoals and of the pools in the river, and the depth of water on the shoals as well as in the pools, in their relation to channel alinement, are discussed with the following conclusions:

Shoals and maximum depths will always be found somewhat down-stream, in the one case from the points where there is a change of channel alinement and in the other case from the points where curvature is most pronounced.

The depth of water in the river will be greatest where the river has most pronounced curvature.

To secure depth, as well maximum as mean, the length of a curve should be neither too short nor too extended. For equal lengths of curved stretches of any river, the mean depth is greatest for that curved stretch whose end tangents include the smallest angle. In other words, the mean depth of any curved portion of the river channel increases with the degree of its curvature.

Any sudden change of degree of curvature is accompanied by a sudden change of depth.

When the alinement of the stream is such that the degree of curvature changes gradually this change determines the pitch or slope of the river bed.

The experiments at Bordeaux were made by a Board of Engineers in 1875-76, which confirmed the observations of M. Fargue, though it was not prepared to endorse fully his conclusions relating to the effect of sudden changes of curvature. The author reviews at considerable length the work of this Board, presenting in diagrams and tables the observed facts and giving greater definiteness to the empirical laws which his Garonne work had led him to formulate.

The artificial channel at Bordeaux was fed with water diverted from above a dam in a small stream. It was first laid out as a channel about 60 meters long and 1 meter wide, with vertical plank sides and a sandy bottom. The alinement shows four curves, each covering an arc of 60°, of which the second and third and the third and fourth are separated from each other by short straight reaches. A second series of experiments followed the first, but on a modified channel. The curvature was increased materially at one point and the channel width was varied with the curvature.

The discussion of these experiments is followed by a reference to the tidal section of the river Scheldt, and to that of the Seine, where the laws noted for the Garonne have been confirmed.

The author deplores the fact that full advantage was not taken of the opportunity to study the movement of sand along the bottom of the artificial channel at Bordeaux.

By analogy, comparing the diagrams prepared to represent stream curvature and depth with the diagram of a sinusoid and its derivative, equations are deduced to illustrate algebraically the laws which have been formulated.

The reader cannot help being impressed by the author's faith in the soundness of his conclusions, but nevertheless the careful engineer will consider the meagerness of the data which serve as the basis for his statement of broad general principles and will make due allowance for the fact that where the relation between the low-water flow, the mean flow and the high-water discharge of a stream is materially at variance with the relation that obtains on the Garonne, other factors remain to be considered, notably the variable rate of gravel and sand movement at the different river stages and the duration of the falling stages of the river during which the bed of the stream gradually assumes the shape revealed at the next low-water period.

The book is an interesting contribution to river hydraulics. The facts presented in it will be welcomed, too, as a valuable contribution to similar studies now being made by Dr. G. K. Gilbert, at Berkeley, Cal., on the transportation and behavior of sand and gravel in straight-line channels by water at various depths and velocities.

◆

Imaginary Aerial Warfare.

AERIAL WARFARE.—By R. P. Hearne. With an Introduction by Sir Hiram Maxim. London, England: John Lane. New York: John Lane Co. Cloth; 5¾ × 9 ins.; pp. xxxix. + 237; 57 plates. $2.50, net.

In reading some parts of this book one wonders if the author intends what he says to be taken seriously; certainly he fails to be convincing to any one with technical training and, of course, it is from the viewpoint of such a person that the book is here considered.

What Mr. Hearne evidently is trying to do is to arouse the British public to demand from the government greater attention to aeronautics and to the place of aeronautics in warfare. He contends that England has done practically nothing to balance the studies and machines of Germany and France and has therefore laid itself open not only to the certainty of defeat in warfare but also to greatly increased liability toward war. This may be true, but the fact is not established by the author's easy disposition of debatable matters. Fact and fancy run hand in hand and speculation treads on the heels of truth. For instance, in writing of the huge Zeppelin airships Mr. Hearne states:

> They will be veritable (very terrible?—Ed.) battleships of the air and, fitted with pneumatic or other guns, aerial torpedo destroyers and a good stock of explosives, they will be intended for destructive raids impossible for small ships. Wireless telegraphy will keep them in touch with headquarters.

The author has not a word to say about the influence of the snapping spark and glowing brush discharge of high-tension radio-telegraphic apparatus in the presence of great bodies of highly inflammable gas in leaking bags. Innumerable Jack Binns wouldn't help matters any, either. A little further on we read:

> A big airship with all these properties could ride out a storm, running before the gale until the speed of the wind abated and using very little fuel meantime. It could then have enough fuel left to take it back to its base, even if that were many hundred miles away.

Let's see. A young gale of 40 mi. per hr. for a couple of days would put the big airship some 2,000 miles out of its course; that is a much more difficult path to retrace than "a few hundred." The author explains, however, in an easy, offhand way, that the aeronauts could take their craft above the storm to quieter regions. Yes—perhaps and sometimes.

Considering the gradual and almost painful way in which progress toward aerial flight has always been accomplished—each step carefully studied before another could be taken—there seems little basis for the statement that:

> The future has most astounding things in store for aeroplanes and at any moment epoch making discoveries may be made which will give new scope to flying machines as distinct from dirigible balloons.

The author's deep knowledge and thorough training in things aeronautical is displayed in the following musing, which needs no comment here:

> Aerostatic vessels of the rigid type with vacuum envelopes, thus dispensing with the use of costly and explosive gas, may also be possible.

The author traces the development of balloons and heavier-than-air machines much as would any other searcher of the records. Following this are pictures of the wars of the future—as they exist in the author's brain. The destruction of Great Britain by Germany gets but little attention, and about this part the whole purpose of the book seems to center.

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MINING METHODS IN EUROPE.—Written after a Visit to Many of the Metal and Coal Mines of Great Britain, France and Germany. By Lucius W. Mayer. New York and London: Hill Publishing Co. Cloth; 6 × 9½ ins.; pp. 169; 92 illustrations in the text. $2.50, net.

After a visit to many of the metal and coal mines of Great Britain, France and Germany, the author of "Mining Methods in Europe" has attempted to present descriptions of the "more or less distinct and often extraordinary systems of mining" practiced in those countries. In all the descriptions, particular attention is given to the actual manner of underground attack. This feature is explained in each case in detail. The numerous drawings and photographs are well chosen and help materially to make clear the working conditions explained in the text.

Part I. is devoted to mining in Great Britain and occupies a little more than half the total number of pages, while Part II. deals with the mines of Germany and France. Part I. covers coal and iron mining and has one chapter on slate quarrying, and in Part II. there are chapters on coal, iron and lead mining. In general each chapter describes some one particular mine and the detailed explanation of mining methods is preceded by a description of the general geographical and geological conditions.

A large proportion of the British mines described use longwall methods, and the author seems to be much impressed with the merits of the longwall system, and expresses the opinion that it could be used with advantage in American mines to a far wider extent than it is at present. The chapters on German and French mines include explanations and discussions of pneumatic and hydraulic flushing systems used, in connection with pillar robbing, to prevent surface subsidence. In Chapter XVII., on coal mining in Silesia, one page is devoted to a description of an experiment chamber for testing explosives. Unlike the recently constructed American testing stations, it is built of wood (three ply, iron bound) and is partially buried in an embankment, leaving exposed only a narrow longitudinal strip containing the observation windows.

There are, unavoidably perhaps, some pages in the book which require close attention and frequent reference to the diagrams for an understanding of the operations described, but as a whole this work demonstrates the possibility of writing technical descriptions and explanations in such a way as to be not only interesting, but easy to read.

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FOUNDRY PRACTICE.—A Treatise on Molding and Casting in Their Various Details. By James M. Tate and Melvin O. Stone. Prepared for the Use of Students in the College of Engineering, University of Minnesota. Third edition, revised. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 4¾ × 7½ ins.; pp. 243; 112 illustrations in the text. $2; English price, 8s. 6d., net.

Although announced as a revised edition, this treatise presents no apparent indications of any very sweeping revision. In the greater part of the book, which deals with hand molding, there is no need of revision, as the tools and methods of the molder remain much the same from year to year, but something might have been done toward modernizing the illustrations and descriptions of machine equipment for foundries.

Being originally intended for the use of students of engineering at the University of Minnesota, this book explains the processes and methods of ordinary foundry practice in language intelligible to one entirely unfamiliar with the baffling technical terminology of that trade. Its glossary of foundry terms helps materially in the attainment of this purpose, as do also the numerous sectional sketches of molds and patterns. One chapter of six pages is devoted to tables of melting points, strengths, shrinkage, weight and chemical composition of various metals and alloys and to tables of size and capacity of foundry ladles and crucibles.

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Mechanical Drawing.

Reviewed by GEORGE H. FOLLOWS.*

A TEXT-BOOK OF MECHANICAL DRAWING AND ELEMENTARY MACHINE DESIGN.—By John S. Reid, M. Am. Soc. M. E., Professor of Mechanical Drawing and Designing, Armour Institute, and David Reid, Formerly Instructor in Mechanical Drawing and Designing, Sibley College, Cornell University, Ithaca, N. Y. Second edition, revised and enlarged. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¾ × 9¼ ins.; pp. 439; 329 illustrations in the text. $3; English price, 12s. 6d., net.

In their preface to this, the second edition, the authors say that "the increasing use of the book, for students of all kinds of engineering, in teaching machine drawing and elementary machine design" has made the present revision desirable.

If this means that the book is in extended use in schools where mechanical drawing and machine design are taught, then it is not surprising that graduate engineers continue to exhibit some ignorance as to what a mechanical drawing really is, how it should be made, or what it is for.

On page 18 of a 47-page introductory chapter we learn why blue prints for shop use are going out of fashion:

> The blueprint system for working drawings has many drawbacks, e. g., the sectional parts of the drawings require to be hatch-lined, using the standard conventions already referred to for the different materials. This takes a great deal of time. The print has usually to be mounted on cardboard, although this is not always done, and unless it is varnished, the frequent handling with dirty, oily fingers soon makes it unfit for use.

Then, after mentioning the disadvantages of using soda water for making changes on blueprints, the authors make the following remarkable statement:

> So, taking everything into consideration, the system of making working drawings directly on cards and varnishing them is probably the best. The drawings are pencilled and inked on these cards in the usual way, and the sections are tinted with the conventional watercolors, which are much quicker applied than the hatchlines. The cards are made of thick pasteboard mounted with Irish linen record paper. The face of the drawing is protected with two coats of white shellac, while the back is usually given a coat of orange shellac.

It is added that this system is now in use by many large engineering establishments and that the making of changes on the cards is quite simple, consisting of removing the two coats of white shellac with a little alcohol, changing, revarnishing, and returning to the shop.

From what source have the authors garnered this remarkable information?

On page 20 the following statement is made, touching the important subject of dimensioning for the shop:

> Drawings should be so fully dimensioned that there will be no need for the pattern maker or machinist to measure any part of them. Indeed, means are taken to prevent him from doing so, because of the liability of workmen to make mistakes; so the drawings are often made to scales that are difficult to measure with a common rule, such as 2" and 4" equal one foot.

Poor, misguided workman! After twenty-six years association with you, I had come to have the greatest respect for your intelligence, your common sense, your ability to go ahead and do things. I know that some draftsmen, particularly those that have graduated from the dry goods counter and become what they are in spite of the fact that they do not know a chuck from a mandril, often give you sore trouble by their erratic dimensioning, but this is the first time I ever heard of any draftsman so jealous of the innermost secrets of his work as to go through all the agonies of making his drawings to odd and peculiar scales.

Let us draw the curtain and pass on to other features of this same introductory chapter. There is given a table of distances, from which we learn that a meter is 3 ft. 3⅜ ins. *nearly*; that a "hand" is 4 ins.; a "palm" 3 ins., and a "span" 9 ins. The "cubit" is carelessly omitted from this table of distances that are supposed to be used by the modern draftsman and designer. But on the next line we are boldly informed that "Each nominal horsepower of boilers requires 1 cubit foot of water per hour." And this is shortly followed by the expression "Radius × 6.28318 = circumference of a circle."

The remainder of the introductory chapter is devoted to miscellaneous data, concluding with a comparison of some of the wire and sheet metal gages.

From this point on, the book consists in the main of an assortment of empirical formulas, tables of dimensions, coefficients of proportion, and illustrations, for such machine parts as washers, split pins, knuckle joints, keys, cotters, and gibs, rivets and riveted joints (in which the method of designing by "links" is not even mentioned) shafting and shaft couplings, pipes and pipe couplings, bearings, soleplates and wall-box frames, belt and rope pulleys, toothed gearing (all theory omitted) valves and oil cups, engine and details and valve diagrams.

The text contains much descriptive matter and gives detail instructions to the student as to how to copy some of the drawings in the book, and how to imitate such as carry with them the necessary proportion coefficients, or tables of dimensions.

It is stated that at Cornell University, where the book is presumably used, the student has access to certain models and machines that he is expected to examine in connection with the text. This method of developing draftsmen has been in use for so long a time that perhaps it would be unfair to criticise it as severely as it otherwise deserves. But it would be equally unfair to manufacturing engineers as well as to all engineering students if no suggestion were made as to what might constitute a course in mechanical drawing and machine design, intended to prepare a student for filling a position in a modern drafting room; and not with the idea that he shall follow along the lines already existing in that room, but that he shall be an active influence toward the development of a more efficient drafting and designing force.*

In the early study of mechanical drawing, the student and teacher alike must first of all realize that they are dealing, not with a craft, but with a "language"; a language intended and used to convey ideas, information, suggestions, and exact and positive instructions *to others*; that it is also a means of solving problems in projection and descriptive geometry; that industrially, in the modern manufacturing concern, every mechanical drawing is a carefully prepared specification, completely illustrated, and carrying full information as to what the finished product is to be.

When working at the board the student should make the best use of the opportunity afforded to do work of extreme accuracy with his own hands.

There is a sound psychological reason for the fact that shapes and proportions drawn carefully freehand are more surely retained in the memory than when the same drawings are made with the aid of drafting instruments. The making of a freehand mechanical drawing is a very personal matter; there is close connection between the mind and the point of the pencil when guided by the hand alone.

All mechanical drawings, except geometrical and projection studies and those made freehand for familiarizing the student with the much-used shapes and details of machine construction, should be made in direct connection with the study and application of the theories of machine design, and most decidedly *not* with the aid of empirical formulas; these latter are deduced from practice and experience, and should be used *in* practice and not in school, except when no others are available.

Dimensioning should be studied as a special feature in connection with undimensioned drawings supplied for the purpose, as affording instructive problems for the student to solve; dimensioning is one of the most important and difficult parts of the draftsman's work.

The student of the English language does not learn to write good English by copying sentences or paragraphs composed for him by his teacher or any other person, but by being assigned themes and writing about them himself. In a general way it should be the same when studying the language of mechanical drawing. It is surely high time that this universal language, of such immense value both scientifically and industrially, should be taught rationally in all our great schools.

Present practice in numerous drafting rooms, much quoted in the book under review, is not a reliable guide to what mechanical drawings ought to be; not only because there is an almost endless variety of present practice, but because in many drafting rooms the practice is the result either of accident or of the work of men whose knowledge of drawing has been picked up.

The teaching of drawing as a "craft," only, should cease; drawing should be taught essentially as a language before we can hope for the general adoption of any uniform system of writing it.

The great amount of money paid annually to the drafting profession should be an incentive to teachers to take this view of the subject and to work unselfishly towards the development of a new type of draftsman. The college graduate should be prepared not merely to imitate but to improve the output of the drafting room he works in. A thorough knowledge of projection is, of course, essential to correct illustrating as well as to the solving of many problems. The use of a comprehensive alphabet of lines is another essential; and in addition, the many mechanical features should be so related as to make the quantity that we call a mechanical drawing of the greatest possible value to all departments of the concern that uses it: To the shop, as illustrating the shape of what is to be made, giving the dimensions as required by the shop, specifying material, indicating finishes, and stating quantities required. To the office and drafting room in connection with correspondence, cataloging, and production data; as a record of what has been made and sold, and as a means therefore of promptly and correctly supplying repair parts; also as the original source for calculating time required for manufacture.

Engineers, designers, and shop men should have a broad knowledge of the language they use so much. Until they have this knowledge and make full use of it, every drafting room will continue to use its own dialect, and as unintentionally illustrated in the last chapter of the book under review, which is devoted to a summary of miscellaneous American drafting room practices, the drawings used in the majority of shops will be something less than 50% efficient.

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British Rainfall.

BRITISH RAINFALL, 1907.—On the Distribution of Rain in Space and Time over the British Isles during the Year 1907, as Recorded by More than 4,000 Observers in Great Britain and Ireland, and Discussed with Articles upon Various Branches of Rainfall Work. By Hugh Robert Mill. 47th annual volume. London, England: Edward Stanford. Cloth; 5½ × 8¾ ins.; pp. 100 + 280; text illustrations and maps. 10 shillings; American price, $4.

For half a century extensive rainfall observations have been conducted by private enterprise from London as a central office. The reports of the observers have been brought together and commented on in a series of yearly volumes. Whether the observations have covered the whole of the United Kingdom from the start we cannot say, but the present volume includes reports for 1907 from over 4,000 observers scattered through England, Wales, Scotland and Ireland. The reports from individual observers are limited to total rainfall for the year, and the number of days on which more than .01-in. of precipitation was recorded. The tabulation, however, includes the diameter of each rain gage and its height above the ground and above sea level; also, the name of the station and the observer. This tabulation occupies about 100 pages. More detailed figures are given in tabular form for intensity of rainfall and number of rainy days for a limited number of stations.

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[*It is only fair to our readers to state that the author of this review is the author of a "Universal Dictionary of Mechanical Drawing."—Ed.]

Special articles deal with thunder storms on July 21 and 22, 1907, on map study and mapping rainfall, and on the effects of severe storms. There are also articles, apparently in accordance with the plan followed yearly, on evaporation and percolation, duration of rainfall, and other pertinent facts deduced from the reports of the observers.

A particularly interesting though brief section of the volume is a series of notes, arranged by days and months, on "some of the principal phenomena" of the year. These notes are drawn from both observers' reports and the daily press. They "refer to extreme or exceptional rather than to normal phenomena." Particularly severe weather was reported from parts of England on Jan. 1. The South Lancaster Tramways Co.'s street-cars, running from Lowton to Bolton, were stopped by snow for six days.

The human element is not overlooked in selecting press extracts for presentation in this section of this book. Thus, in connection with a report of a farmstead near Market Drayton snowed in for a number of days, it is stated that

> the beleaguered household suffered little inconvenience, as the farm contained a good stock of provisions for a siege. Mr. Boyden's chief grievance was that his supply of tobacco had run out.

Another quotation of the human-interest sort is as follows:

> A Kilburn umbrella-maker sued at the Marylebone County Court, said the weather had been dead against him this season, and had "ruined his business." The Judge gazed thoughtfully at the skylight, on which the rain was at that moment pattering, and made an order for 13s. payment.

Reverting to the more practical side of the book, we may note that there was recorded for 1907 only 32 heavy rains of less than two hours duration. The average rate of the rainfall for these rains was 1.72 ins. per hour. The heaviest rainfall was 2.49 ins. in 70 mins. It is stated that this is the only record since 1903 of a rainfall in excess of 2 ins. per hour extending over so long a period. The maximum rates per hour for brief periods up to 30 mins. were as follows: 3 min., 3.20 ins.; 5 min., 3; 20 min., 3.42; 20 min., 3.30; 30 min., 3.22 ins.

Considering whole days and all stations, there were 121 days in 1907 on which there was a total rainfall of more than 2.5 ins. per hour or else a rainfall for the day which was 7.5% of the total yearly fall. These percentage figures are included for the sake of bringing out markedly heavy daily falls in sections of the country where the total yearly fall is low. The 16 highest daily records for the year ranged from a fall of 5.95 ins., or 3.9% of the total yearly fall of 154.34 ins. on Snowdon, to 3.12 ins., or 10.3% of the yearly fall of 30.18 ins. at Edinburgh.

To gain more specific information than was at hand regarding the relation of the British Government to rainfall records the editor addressed a letter of inquiry to Mr. Mill, who replied as follows:

> The British Meteorological Office, has a large organization adapted for the special purposes for which it was founded, i. e., the study of the meteorology of the oceans, and the study and forecasting of the weather of the British Isles; but from reasons which date back to before 1860, it was not considered necessary to make full observations of rainfall, and accordingly the work was taken up by my predecessor, Mr. Symons, as a piece of scientific research. How the Rainfall Organization has grown since then, and how it has now become a self-supporting institution of voluntary observers unique in the world, is set out in the little pamphlet, a copy of which I enclose.

We quote from two highly interesting paragraphs from the pamphlet sent by Mr. Mill:

> The British Rainfall Organization was inaugurated and brought to maturity by the late George James Symons, whose working life of over forty years was entirely devoted to it. In 1859, as a youth of twenty, employed in the Meteorological Department of the Board of Trade, Mr. Symons began to collect records of rainfall, and in 1861 he published a four-page quarto leaflet, now very rare, entitled "English Rainfall, 1860," giving the total rainfall recorded by 168 Observers. In the following year he brought out an octavo pamphlet of 18 pages, "British Rainfall, 1860-1861," which included 507 records from all parts of the British Isles. The Meteorological Office let Mr. Symons go; but as a private individual he perfected the largest system for dealing with rainfall statistics which exists in any country. "British Rainfall" has appeared every year since its foundation, growing in bulk and importance. In 1865 the number of returns passed 1,000, in 1877 it exceeded 2,000, in 1894 it reached 3,000, in 1905 it first exceeded 4,000, and now some 380 pages are required to deal with more than 4,300 returns.
>
> The history of the Rainfall Organization has been one of hard work and steady progress. In 1890, Mr. H. Sowerby Wallis, who had assisted Mr. Symons since 1872, became co-editor of "British Rainfall," and on the death of the founder in 1900, he was left in charge of the whole work. A few months afterwards the opportunity of continuing researches on rainfall and kindred subjects, to which I had devoted attention for twenty years, was offered to me by Mr. Wallis, and we carried on the work of the organization jointly from Jan. 1, 1901, until Sept. 1, 1903, when ill-health compelled him to retire, and I was left with the sole responsibility.
>
> Although the work of the British Rainfall Organization is national in its scope and magnitude, it has never received aid from the State. Mr. Symons at first bore the whole expense himself, but after a time some of the Observers, whose means permitted them to do so, kindly offered to share it with him. His Majesty the King now heads the list both of Observers and Subscribers. The Observers include Judges and Bishops, members of both Houses of Parliament, country gentlemen, hundreds of clergymen, medical men, engineers and farmers, as well as gardeners, shepherds, railway porters, and even domestic servants. The association of all classes of the community actuated by many different motives in accumulating data for scientific discussion is, I believe, absolutely unique.

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MORTALITY FROM CONSUMPTION IN DUSTY TRADES.—(By Frederick L. Hoffman.) From Bulletin No. 79, Bureau of Labor, November, 1908. Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.; pp. 633 to 875.

Forty-two dusty trades and their relation to consumption are here considered, the trades being grouped according to whether they produce metallic-, mineral-, vegetable-fiber or animal- and mixed-fiber dust. The literature of the subject seems to have been thoroughly searched by the author. A considerable number of statistical tables are given. Measures for the prevention or diminution of dust are taken up. Appended to the monograph is an extensive "list of references on occupation mortality." Altogether the monograph is a valuable contribution to public-health literature, as might be expected in view of Mr. Hoffman's well-known reputation as the statistician of the Prudential Insurance Co., of Newark, N. J., and a deep student of the relation between occupations and disease and mortality.

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ACCIDENTS AND EMERGENCIES.—A Manual of the Treatment of Surgical and Medical Emergencies in the Absence of a Physician. By Charles W. Dulles, M. D., Fellow of the College of Physicians of Philadelphia and of the Academy of Surgery, Consulting Surgeon to the Rush Hospital. Seventh edition, thoroughly revised and enlarged. Philadelphia, Pa.: P. Blakiston's Son & Co. Cloth; 4¾ × 7¼ ins.; pp. 205; 44 illustrations in the text and 1 plate. $1, net.

The fact that "six large editions" of this book have been sold is in itself a good recommendation for the work. The present edition has been enlarged. The instructions given in the book are clearly and briefly put, and are accompanied by helpful illustrations. The volume is just the thing for the camp of the engineer or contractor, and is equally valuable for the home, except that usually medical and surgical assistance are readily obtainable there. But even with a doctor within telephone call, such a book might often prove extremely valuable, either for emergency use or in case of some slight accident to render the call of the doctor unnecessary. The sixth edition was reviewed in our issue of Nov. 17, 1904.

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REPORT ON THE MINING AND METALLURGICAL INDUSTRIES OF CANADA, 1907-8.—Eugene Haanel, Ph.D., Director Mines Branch, Department of Mines. Ottawa, Canada: Pub. Doc. Paper; 6½ × 9¾ ins.; pp. xvi. + 972; numerous folding and other plates, 20 drawings and 6 maps. $1.

All the metallic and non-metallic mineral mines and the metallurgical and clay industries in the Dominion of Canada are described in this cumbrous volume. The numerous illustrations show general views of the more important mining districts, and in some cases are added sketch maps of the mines and flow sheets of mills. Large insert mineral maps of the several provinces show the location of the known metallic ore and commercial mineral deposits that are being worked.

The book is arranged in two parts, dealing respectively with the general mining and metallurgical industries and with non-metallic structural materials, such as brick, tile, stone, cement, etc. In both parts, the inform[illegible] is subdivided according to provinces.

Each subdivision opens with a [illegible] historical sketch of the mineral industry i[illegible] province under consideration, and this is [illegible]wed by a review of the local methods of m[illegible]g or milling. The remainder, and by far th[illegible]ater part, of each subdivision constitutes a d[illegible]ry of the mining and mineral industries. [illegible] name of owner, magnitude, equipment, m[illegible] of operation and number of men employe[illegible] listed for every mine and plant and, in the [illegible] of regularly organized companies, the capi[illegible]tion and personnel of the company is given.

A double index is provided, of wh[illegible] the first part is an alphabetical arrangement [illegible] names of minerals and mines, following th[illegible]me geographical arrangement as in the tex[illegible] while the second is a purely alphabetical list [illegible] names of operators and mine owners.

The book seems remarkably free [illegible] typographical errors, and this promises w[illegible] for the general accuracy of the information [illegible]tained.

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THE FIRST INTERNATIONAL ROAD CONGRESS.—Paris, 1908. By G. Montagu Harris, Secretary to the County Councils' Association, and H. T. Wakelam, M. Inst. C. E., County Engineer and Surveyor of Middlesex. London, England: Wyman & Sons, Ltd. Cloth; 6 × 9¾ ins.; pp. 143; text illustrations. 3s. 6d.; American price, $1.50.

TRANSLATIONS OF PAPERS BEFORE THE FIRST INTERNATIONAL ROAD CONGRESS.—Asphalt and Wood Pavements in the City of Paris, by M. P. Tur, Chief Engineer of Bridges and Roads, etc., of Paris; The Requisite Qualities of Wood for Pavements, by M. Louis Mazerolle, Engineer of Bridges and Roads of Paris. New York: Board of Estimate and Apportionment (Nelson P. Lewis, Chief Engineer). Paper; 6¾ × 10 ins.; pp. 58.

Those who were unable to attend the recent Road Congress at Paris—and the number includes almost every one interested in road making and maintenance—will find this epitome of transactions as good a substitute as could be expected in the way of a brief printed report of the proceedings.

After a brief introductory statement, which includes the resolutions adopted by the Congress, a few paragraphs follow on the exhibits of roads and road-making and maintaining appliances, and also on the excursions. These excursions included trips to inspect tar-painted road surfaces and paving in Paris, and also visits to Versailles, Fontainbleau and Nice. Notes on the roads and pavements passed over on the Versailles and Fontainbleau trips, and also on the pavements of Nice, are given.

Coming to the main part of their summary of the proceedings of the Congress, the plan of the authors is to present the resolutions of the Congress on a given topic, and then to summarize briefly the various papers bearing on the subject. These summaries of papers run all the way from two lines to two pages. An appendix gives the names, official titles and addresses of the authors of the papers summarized. There is also an appendix of equivalents of metric and English measures, and of French, German and foreign moneys.

It should be noted that many of the papers summarized deal more or less fully with the motor-vehicle as related to road construction and maintenance.

We print on the first page of this Supplement a translation of a poem, *La Route* or The Road, recited at an entertainment in Paris given in honor of the Road Congress. The book under notice contains the French original as well as the translation which we quote.

A summary of the Proceedings of the Congress, by Mr. N. P. Lewis, M. Am. Soc. C. E., appeared in Engineering News of Jan. 21, 1909.

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LECTURES ON THE STATUTORY PROVISIONS RELATING TO GOVERNMENT CONTRACTS.—Delivered before the Engineer School, U. S. Army, Washington Barracks, D. C., by John Mason Brown, LL.B., March, 1908. Washington, D. C.: The Author (National Metropolitan Bank Building). Cloth, 6 × 9 ins.; pp. 68. $1.50.

These lectures were first published in a very limited edition by the Engineer School for its own use and were then reviewed in our issue of Sept. 17, 1908, p. 316. Mr. Brown has now revised and re-edited them for general sale and added a full table of cases and an index.

Electrical Calculations.

Reviewed by HENRY H. NORRIS.*

VECTORS AND VECTOR DIAGRAMS.—Applied to the Alternating Current Circuit. With Examples of Their Use in the Theory of Transformers, and of Single and Polyphase Motors, etc. By William Cramp, Consulting Engineer and Special Lecturer in Electrical Design in the University of Manchester, and Charles F. Smith, Assoc. M. Inst. C. E., Lecturer in Electrical Engineering, The University of Manchester, and Director of the Electrical Engineering Laboratories, Municipal School of Technology, Manchester. London, New York and Bombay: Longmans, Green & Co. Cloth; [illegible] × 8¾ ins.; pp. 252; 114 illustrations, mostly in the text. $2.50, net.

PRACTICAL CALCULATION OF TRANSMISSION LINES.—For Distribution of Direct and Alternating Currents by Means of Overhead, Underground and Interior Wires for Purposes of Light, Power and Traction. By L. W. Rosenthal, Assoc. M. Am. Inst. E. E. New York: McGraw Publishing Co. Cloth; 6 × 9½ ins.; pp. 93; 2 text illustrations; 42 tables. $2.

As the name implies, this work on Vectors is a book in which the branches of mathematics necessary in the study of electric circuits are explained and illustrated. It contains a synopsis of the algebra and geometry which are directly applicable to the solution of alternating-current problems and no more. A working knowledge of this material is absolutely essential to an electrical engineer who expects to understand the theory of electrical circuits and machines and who desires to read intelligently the more theoretical discussions in the technical press. While the title is formidable the treatment is not so. It can be readily followed by a reader who is familiar with higher algebra and geometry and who has a practical acquaintance with electrical circuits and machines. The authors assume such a knowledge on the part of the reader "as an electrical engineering student in his third year might fairly be expected to possess." This is a rather optimistic estimate of the amount of information possessed by a college junior. In view of the crowded curricula of the American technical schools it is doubtful if a senior is more than prepared for a text of this kind. The junior would have no trouble with the mathematics, but he would not possess the raw material which it is the function of the mathematics to organize. Hence the later in the course at which this study is begun, the more will the student get out of it.

The authors have adopted a modification of the symbolic method of analysis introduced some years ago by Dr. Chas. P. Steinmetz. They have simplified this for the purposes of the beginner so that less mathematical skill is required. At the same time they have endeavored to maintain a close connection between the algebraic expressions and the physical facts. That is, the symbols and their interpretation are closely interwoven. This is possible in an electrical mathematical text only when written by electrical engineers. Such writers have always in view the applications of the mathematics; in fact the applications are primary, the mathematics secondary. From the outset every mathematical operation is illustrated by one or more electrical applications. These illustrations form, in themselves, a considerable source of information aside from their principal purpose. The method followed is the ideal one for the teaching of mathematics, both elementary and advanced. The successful teacher of trigonometry applies it to determine the heights of trees and steeples near the school and the area of a neighboring pond. In algebra the pupil calculates where his friends Jones and Smith will meet if they approach each other from nearby towns at different rates. From the new book by Messrs. Cramp and Smith the student learns how to determine the e. m. f. of an alternator by adding vectorially the e. m. f's of the several armature coils in a circuit.

As the reader progresses through the book he will note three distinct features: (1) the mathematical conventions and definitions with illustrations to render them fully intelligible; (2) the electrical elements of circuits and machines and the relation of these to the conventions and definitions; and (3) the more general application of the methods to the purposes of research. Three chapters are devoted to vector representation, vector algebra and the multiplication of vectors. These contain a few numerical examples based upon simple apparatus. In each of several following chapters a particular electrical topic forms the basis for an application of vector analysis. These chapters are largely made up of practical problems, many of which have detailed arithmetical solutions. Next is explained the physical meaning of the product of vectors, and finally the circle diagram and its applications are discussed in detail.

The authors of this work are practical engineers. Mr. Cramp is a consulting engineer and lecturer; Mr. Smith is a teacher who has published several books of a distinctly practical character. The practical attitude toward their subject is indicated by their casual comments on the results of the mathematical analysis. These suggest to the reader the desirability of a constant effort to think in fact and not in symbols.

There is no "padding" in the calculator's handbook into which Mr. Rosenthal has gathered a collection of original tables. These tables, with the formulas which accompany them, make possible the rapid solution of all ordinary transmission problems with small chance of error. In preparing the book the author has had in mind the engineer whose duties require quick, accurate results in circuit calculation.

The method employed is simple and direct. It requires very few approximations but involves the use of numerous tables of factors. The formulas employed in electrical calculations are necessarily cumbersome on account of the many variables which they contain. These variables may be grouped into factors which may be calculated once for all by assuming a number of values for each variable in turn. The values of the factor may them be tabulated for convenient reference. The object in using factors is that they may be combined by simple multiplication, a slide-rule operation. This factor plan is the one followed by Mr. Rosenthal.

As an example of these factors, of which a number are used, the "wire factor" may be selected as typical. This is a quantity which includes the effects of resistance and reactance in the line and of the power factor of the load. For commercial calculations of overhead transmission circuits 10 tables of this factor, containing more than 4,000 values, have been provided. The variables included are frequency, spacing, size and material of conductor and load power factor. The frequencies tabulated are 15, 25, 40, 60 and 125 cycles per second; the spacings are 18, 36 and 60 ins.; the materials are copper and aluminum. Loads of all ordinary power factors are provided for and the sizes of wire range from No. 8 B. & S. G. to 500,000 circular miles.

Each chapter of the book contains a brief statement of the elements of the problems covered, with the formulas necessary for their solution. The formulas of each chapter are grouped in a table which is, in most cases, placed just before the factor tables. The use of the tables is illustrated by means of a large collection of interesting and practical problems collected from several sources. These are all worked through numerically, references to the proper factor tables being given at each step.

The author's method is followed for direct and alternating-current power distribution, both overhead and underground. Traction circuits for direct and alternating current are included. The work is therefore very comprehensive. In spite of the small size, less than 100 pages, it is reasonably complete because it deals with a definite proposition in a definite way. There is no unnecessary description of the method, each topic being covered in a terse paragraph. The lack of an index is partly made up by a complete table of contents.

◆

SAN DIEGO.—A Comprehensive Plan for Its Improvement. By John Nolen. (Harrisburg, Pa.: Secretary, American Civic Association.) Boards; 6 × 9¼ ins.; pp. 109; numerous illustrations in the text. 60 cts.

REMODELING ROANOKE.—Report to the Committee on Civic Improvement by John Nolen, Landscape Architect, Cambridge, Mass. (Address Mrs. Lucien H. Cooke, President of the Civic Betterment Club, Roanoke, Va.) Stiff paper; 8 × 10½ ins.; pp. 40; numerous folding and other plates. 60 cts.

CITY MAKING.—John Nolen, Cambridge, Mass. (Paper read at the meeting of the American Civic Association, Pittsburg, November, 1908.) Paper; 6 × 9 ins.; pp. 8.

The more progressive of our American cities, either through their officials or civic associations, are recognizing as never before the value of the esthetic side of city planning and improvement. Within the past few years we have called brief attention to a number of reports following much the same line as those which Mr. Nolen has made on San Diego and Roanoke. In the reports before us a variety of improvements are suggested in the way of the grouping of public buildings around common centers, better-designed streets, parks, parkways and playgrounds, and the acquisition by the city of extensive areas of land for public reservations within or without the city limits.

Each of these reports is accompanied by illustrations, both half-tone and line drawings. Many of the half-tones show municipal improvements carried out elsewhere, which might serve as models for the cities under consideration; and some of the views illustrate pieces of local development unsurpassed by anything pictured as having been accomplished elsewhere. Each volume is an excellent piece of bookmaking, while the reports themselves are a credit both to the author and to those who engaged him.

The small reprint is a brief statement of some of the principles of city planning.

◆

THE NEW BUILDING ESTIMATOR.—A Practical Guide to Estimating the Cost of Labor and Material in Building Construction, from Excavation to Finish; with Various Practical Examples of Work Presented in Detail, and with Labor Figured Chiefly in Hours and Quantities. By William Arthur. New York: David Williams Co. Cloth; 4½ × 6¾ ins.; pp. 424; 14 illustrations in the text, and numerous tables. $2.50, net.

Bearing in mind the usual restrictions of books on cost data—that they are merely approximations suitable for rough estimates and in no wise accurate for any specific case, though they may be very close to an average—this fifth edition of a book originally reviewed in Engineering News, Aug. 18, 1904, p. 160, should prove of considerable value to the "architects, builders, contractors, appraisers, engineers, superintendents and draftsmen" noted in the title. Mr. Arthur is an experienced builder, so that the data on pure buildings is much more complete and authoritative than that on bridges, pavements, steel-work, etc., which the author evidently has taken from other sources than his own information.

◆

BULLETINS, UNIVERSITY OF ILLINOIS ENGINEERING EXPERIMENT STATION.—Urbana, Ill.: The University. Paper; 6 × 9 ins.

N. 27: Tests of Brick Columns and Terra Cotta Block Columns. By Arthur N. Talbot and Duff A. Abrams. Pp. 50; one plate and ten text figures.

No. 28: A Test of Three Large Reinforced Concrete Beams. By Arthur N. Talbot. Pp. 25; 14 illustrations, mostly in the text.

The first of these two bulletins describes a series of tests on 16 short columns or piers of brick and 16 columns of terra-cotta blocks. All columns were from 10 to 12½ ft. long and the brick section was 12½ × 12½ ins., while the terra-cotta sections varied from 8½ × 8½ ins. to 17½ × 17½ ins. All were laid up in mortar, under varying conditions of workmanship and tested in a machine to failure under an increasing compressive load.

The second bulletin covers in much more com-

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plete style the tests of full-size reinforced-concrete beams described in Engineering News, Aug. 6, 1908, p. 146. These beams, probably the largest ever tested, were taken at random from a number ready for erection on a crossing of the Illinois Central R. R., and were tested in the field by a specially-rigged hydraulic jack machine. The size and design of the beams, the method of testing and the fact that they were taken from actual construction, all lend a peculiar interest to the account of the tests.

◆

A Revised Edition of Durand's Ships.

Reviewed by D. W. TAYLOR.*

THE RESISTANCE AND PROPULSION OF SHIPS.—By William F. Durand, Professor of Mechanical Engineering, Leland Stanford Junior University. Second edition, thoroughly revised. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¾ × 9¼ ins.; pp. 427; 110 illustrations in the text. $5; English price, 21s., net.

Professor Durand's well-known work, which first appeared in 1898, has been revised by the author. Much new matter has been added and somewhat more cut out, with the net result of four pages of reduction.

The work represents substantially lectures given by the author to the students in the school of Marine Construction at Cornell University when he was in charge of that school. Hence it naturally approaches its subject from the point of view of the student rather than the working naval architect or marine engineer.

Under resistance, the author discusses briefly stream lines, analyzes the causes of resistance of ships, classifies the various kinds of resistance and discusses their laws of variation. In considering frictional resistance, the author gives the usual tables of coefficients due to Froude and Tideman and adds constants which he states are "commonly employed at the U. S. Naval Tank." The values given should be supplemented by a statement that they apply to 20-ft. frictional planes and models, as the constants given are used only for such surfaces at the model basin in Washington.

Under propulsion, the author considers first formulas, etc., for screw-propeller action and treats briefly the paddle wheel and hydraulic propulsion. He then takes up questions of wake and thrust deduction and finally passes to questions of propeller design. It is here that most of the new matter has been added in this edition, as the author gives a method of his own for propeller design, including complete tables based upon model experiments made under his direction at Cornell University. The results of these experiments have been published by the Carnegie Institute.

There is some little confusion in the beginning of the section on propeller design, owing to the fact that on page 241 there are several references to equations and matter contained in the first edition, but cut out of the present book.

Under powering ships, the author gives a number of the best-known English methods, but does not recommend definite constants or coefficients for their application. This lack of information is largely made good, however, by tables of speed and power results for a large number of actual vessels.

In his final chapter the author discusses quite fully the question of trial trips, methods to be used, and the various points to be considered in connection with the determination of speed and power curves.

It is to be hoped that Professor Durand will be able, in future editions, to bring portions of the work still further up to date. The article on cavitation, for instance, is practically the same as in the 1898 edition, and although the present knowledge of cavitation is by no means complete, it is a good deal further advanced than it was ten years ago.

For convenience of study, it would be an improvement if references in the book to its various sections included the pages at which the sections begin. This would much facilitate locating sections referred to. The same remark applies to references to figures and equations.

The typographical work is very good, there being but very few errors. In Sec. 49, there are two equations numbered (1). The equation on page 245 should be numbered (2) and the references on page 247 changed to (2).

On page 252, in bringing forward his own method of propeller design, the author says:

> So far as the method itself is concerned, there may result an indefinite number of propellers, each more or less completely fulfilling the conditions imposed, and in the discrimination between these full scope may be found for the use of judgment and experience. It is intended rather as an aid to the intelligent use of experience, and to the systematic analysis of the results of trial data.

This remark is largely applicable to the work as a whole, the author giving on most subjects treatment from several points of view and paying more attention to underlying theory and scientific analysis than practical application.

It follows that this book, while valuable and useful to any one interested in its subject, will appeal most strongly to the student who is mostly concerned with theory and principles rather than practical applications.

◆

A Standard Textbook on Alternating Currents, Rewritten.

ALTERNATING-CURRENT MACHINES.—Being the Second Volume of Dynamo Electric Machinery, Its Construction, Design and Operation. By Samuel Sheldon, Ph. D., D. Sc., Past-President Am. Inst. E. E., Professor of Physics and Electrical Engineering at the Polytechnic Institute of Brooklyn, and Hobart Mason, Assoc. Am. Inst. E. E., and Erich Hausmann, Assoc. Am. Inst. E. E., Instructor in Electrical Engineering at the Polytechnic Institute of Brooklyn. Seventh edition, completely rewritten. New York: D. Van Nostrand Co. London, England: Crosby Lockwood & Son. Cloth; 5 × 7¾ ins.; pp. 353; 236 illustrations in the text. $2.50, net.

The volume first issued by Professor Sheldon and Mr. Mason in 1902 has proved a popular textbook and, after running through six editions, comes to hand entirely rewritten and greatly enlarged. The rearrangement will add to the value of the book for many teachers and students, but will probably detract from its popularity with a few others on account of an apparent loss of simplicity. However, the simple presentation of the early editions remains and the study of the additions can be omitted if teachers find them undesirable for certain classes. This last edition does not appear quite as well adapted to the ability of the home-study reader who will not so easily grasp, as before, the relative importance of sections. On the whole, this larger book shows desirable transposition and amplification in parts which before were not quite sufficiently explicit for the majority of students.

The general arrangement of the text is like the first edition. The authors, after explaining the peculiarities of alternating currents and circuits, discuss the two most important properties of alternating-current circuits—inductance and capacity. While there is frequent recourse to graphical explanations there is no evasion of simple calculus. This fore part of the book, a little less than a third of the whole, forms what might be called an introduction to things more directly suggested by the title. These are brief descriptions of generators, motors and transformers with longer discussions of the theory of design and operation.

On comparing this seventh edition with the first, one of the most important additions noticed is the group of 12 problems placed at the close of each chapter, and embodying the application of principles studied therein. The use of imaginary complex numbers has been resorted to for extended study of impedence and admittance of circuits. This was carefully avoided at first. A third important addition is the matter on single-phase series motors, which have come into prominence through recent notable advances in alternating-current railroad engineering.

◆

THE LIFE STORY OF SIR CHARLES TILSTON BRIGHT, CIVIL ENGINEER.—With Which Is Incorporated the Story of the Atlantic Cable, and the First Telegraph to India and the Colonies. (Revised and abridged edition.) By Charles Bright, F. R. S. E., Author of "Submarine Telegraphs," etc. London, England: Archibald Constable & Co., Ltd. Cloth; 5½ × 8¾ ins.; pp. 478; numerous illustrations in the text. 12s. 6d., net; American price, $5.

The life story of the precocious inventor, Charles Tilston Bright, resembles that of the great American, Thomas A. Edison, whose most notable work was commenced at about the time this Englishman began to lay a[illegible] his own. This life resembled Edison's in being so closely interwoven with his inventions [illegible] the true story of the one can not be separated from the descriptions of the others.

The work of this man was of a w[illegible] character, but he will be remembered as the great pioneer telegraph engineer, who contributed more than any other one person to the success of the Atlantic cables. The greater part of the book before us describes the laying of these cables. The diaries and letters of Charles Bright have been largely drawn on for pen pictures of [illegible] progress of the great undertaking.

Engineers who are fortunate enough to have time to read this book will appreciate the care and technical accuracy which mark the text. It is a welcome change from the newspaper writers' tales of great engineers and their works.

◆

THE ENGINEERING ASPECT OF RECENT ADVANCES IN CONNECTION WITH SEWERING. By W. D. Scott-Moncrieff. Chadwick Lectures, University of London, Session 1907-08. London, England: St. Bride's Press, Ltd. Paper; 5½ × 8½ ins.; pp. 79. 2s., net; American price, 80 cts.

In these four interesting lectures the author managed, notwithstanding his brief limitations of time, to convey a considerable amount of historical and general information on not only sewerage systems and the house connections therewith, but also on sanitary legislation and sewage purification. In addition, he has also given what will interest many people more—his own ideas on a number of phases of the subjects treated. That he has ideas on sewage treatment, and very pronounced ones, is known to every one who has followed at all closely the literature of the subject of sewage purification during the past dozen years or so.

The author is probably best known outside of England for his multiple system of sewage filters, consisting, as originally proposed, of beds one above another, designed to give each class of bacteria an opportunity to do the work for which it is best fitted, on the division-of-labor plan. In addition, the author has developed a sewage distributor which has received very favorable mention as to efficiency, but is almost universally considered prohibitive in cost. The author is perhaps least known outside of England for the thing on which he seems to pride himself most—although we may be mistaken in this estimate—namely, a device and method for standardizing preliminary tests of sewage, with a view of determining to a certainty in advance just what can be expected of the works designed for purifying sewage, and also just how those works should be designed. This scheme of Mr. Scott-Moncrieff's is not described in his lectures, although the principles involved are outlined and strongly advocated.

The lectures as a whole are very readable and interesting. They contain a number of suggestions worthy of consideration by almost any one who has to do with sewage purification, and in addition they stimulate ideas on the subject, many of which, it must be stated, would be quite at variance with those held by the author himself.

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The Do rs and Cents of Cleanness and Dirtiness.

THE COST CLEANNESS.—By Ellen H. Richards, Instructor Sanitary Chemistry, Massachusetts Institute of hnology. New York: John Wiley & Sons. London hapman & Hall. Cloth; 5 × 7½ ins.; pp. 109.

Mrs. R ards states that her "Cost of Living" series, o hich this is the fourth volume,* is designed r the "intelligent family with $1,500 to $3,00 year income." For a family with an income $3,000 a year, sheltered by "an ordinary t-room house," the author estimates that keeping the house clean costs $248 a year; care of nsils, $180; laundry for "house of five persons, $100; total cost of keeping house, utensils, nen, etc., clean, $528. Besides this, $100 should be added "for personal cleanliness." The basis of these estimates is given in the book, together with many hints for so designing and decorating houses, doing housework and keeping clean generally, as to secure more cleanness at less cost.

Following the chapters on house and personal cleanness there are two chapters entitled The Clean City and The Cost of Uncleanness. For aid in the preparation of these two chapters acknowledgment is made to Mr. Royce W. Gilbert. The final chapter aims to point "The Way to Future Cleanness." It deals particularly with "effective cooperation" and with "education."

In reviewing Mrs. Richards' "The Cost of Shelter" (Jan. 18, 1906) we called attention to her proposition for heating houses electrically by means of a

> sort of dado carrying wires safely embedded in a non-conducting substance, or in the form of a carpet threaded with conducting wire.

This was put forth as a possibility. We are now told that we may expect a speedy realization of not only heating but various other household services by electricity. Thus:

> The time is rapidly on us when a small motor in the cellar will clean, ventilate, cool or heat the house and, I think, cook, and wash dishes. The electric motor is destined to figure as the housewife's friend.

Certainly the emancipation of woman is at hand, *but*

> it goes without saying that unless she develops into a sort of helpless queen bee she must learn to run machinery. Schools for chauffeurs have not refused to take women to learn to run automobiles; schools for household mechanics will come next. Here is an opportunity for something new. Who will be the first to found the —— institute for house engineers or domestic automaids?

These flights of the imagination do no harm to anyone unless it be to the author's reputation for scientific balance and sense of humor. What seriously discredits her and the magnificent technical institution with which she has been so long and so efficiently connected is such a sanitary anachronism as "just above the diphtheria level," as applied to household cleanness. Still further: In one of the chapters written jointly by Mrs. Richards and Mr. Gilbert we find two quotations, evidently endorsed by the author, which embody two other sanitary anachronisms: one to the effect that since the streets of Vera Cruz have been cleaned by a daily flushing, yellow fever has disappeared; and another that

> The death rate in Rome has fallen from 30 per 1,000 to 10 per 1,000 since it raised its street cleaning expenditure from $15,000 to $280,000 a year.

A little further on we find a statement, this time not a quotation, to the effect that the cost of "clean water" is from "two to ten times that of plain water." It may be, but such statements should not be spread among laymen without explanatory qualifications, especially in view of the fact that oftentimes water can be purified for about 1 ct. per 1,000 gals., including capital charges.

We have given a large amount of space to a small book because both the book and the series to which it belongs are serious and on the whole successful efforts to set forth many of the fundamental principles of household and personal hygiene, sanitation and economics. Each book in the series deserves to run through many editions. If in future revisions the author sees fit to retain her imaginary statements regarding the possibilities and near-by certainties of electrical household do-it-alls we shall not take it greatly at heart, but we shall be disappointed if she does not at least add qualifying foot-notes regarding the diphtheria level; street cleaning, yellow fever and the general death rate; and the cost of pure as compared with impure water.

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* The earlier volumes are: Cost of Living; Cost of Food; Cost of Shelter.

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The Humanization of Modern Industrialism.

SOCIAL ENGINEERING.—By William H. Tolman, Ph. D., Social Engineer; Director, American Museum of Safety; With an Introduction by Andrew Carnegie. New York: McGraw Publishing Co. Cloth; 6 × 9½ ins.; pp. 384; illustrated. $2, net.

Social Engineering, otherwise, and perhaps more commonly, known as Industrial Betterment, is, in its widespread exhibition, a comparatively recent development. It is a recognition on the part of employers that they have some obligations of common humanity towards the wage-earners whom they bring together under the forced and cramped relations of modern industrialism. Where such recognition does not prevail, and it is only beginning to show itself as yet, human beings are treated as so many machines in the establishment of the manufacturer, but with this difference: the inanimate machines are given every attention which the mind can conceive to maintain and increase their efficiency to prolong their life, while the human machines are allowed to go to scrap, or the devil, with little or no preventive effort.

The book before us contains a large amount of classified information regarding efforts of industrial and social betterment on the part of many employers of labor. This information is brought together under the chapter heads of efficiency, promotion, the social secretary, hygiene, safety and security, mutuality, thrift, profit sharing, housing, education, recreation, and communal or social betterment. Some further information is given in the concluding chapter entitled "Does it Pay." Here one finds about all the book contains in the way of general summary or statement of principles.

The plan of the book, as just indicated, seems to make considerable repetition unavoidable. There is more or less repetition, beside many references in different chapters to the same industrial concern. These characteristics, however, do not detract very greatly from the book, especially if it be considered chiefly as a work of reference, rather than one for consecutive reading. It is worth reading from cover to cover—with judicious skipping—by any one who is interested in the great social problems of the day. But its value would have been increased if the author had written an introductory chapter, setting forth some of the general principles involved in his main subject.

A feature of the book which adds to its interest, and possibly somewhat to its usefulness, is the statement in foot-notes of the name and address of the industrial concern under discussion at the moment, together with the class of industry represented, if the name of the company does not disclose that; date of organization, and the number of employees.

The book is not overloaded with illustrations, as are many such works. The half-tones included are well chosen and executed.

Mr. Andrew Carnegie contributes a very brief Introduction, in which he commends the book "to all interested in the welfare of their fellows, especially of the workers." It may be added that the author has been one of the moving spirits in two recent expositions of safety devices. These expositions, and the propaganda accompanying them, have resulted in the formation of the "Museum of Safety and Sanitation," which was incorporated in 1909 with Mr. Charles Kirchhoff (of the "Iron Age") as Chairman, and the author of this book as Director.

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◆

PRACTICAL CONCRETE-BLOCK MAKING.—A Simple Practical Treatise for the Workman, Explaining the Selection of the Materials and the Making of Substantial Concrete Blocks and Cement Brick; together with Directions for Making Molds and Remarks on How to Obtain the Best Architectural Effects. By Charles Palliser, Author of "American Architecture," etc. New York: Industrial Publication Co. Cloth; 4¾ × 7½ ins.; pp. 74; 19 illustrations in the text. 50 cts.

MODERN CEMENT SIDEWALK CONSTRUCTION.—A Practical Treatise for the Workman, Explaining in Simple Language the Method of Making Durable Cement Sidewalks. By Charles Palliser, Author of "Practical Concrete-Block Making," etc. New York; Industrial Publication Co. Cloth; 4¾ × 7½ ins.; pp. 64; nine illustrations in the text. 50 cts.

These two little books, published in similar form, take up in the plainest language the construction of elemental concrete work. They are obviously intended for the workingman who wishes to branch out from the older forms to which he has been accustomed, and for this they are quite satisfactory.

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Diseases of Occupation.

DISEASES OF OCCUPATION.—From the Legislative, Social and Medical Points of View. By Thomas Oliver, M. D., F. R. C. P., Physician, Royal Infirmary, Newcastle-upon-Tyne; Professor of Physiology, Durham University. New York: E. P. Dutton & Co. Cloth; 5½ × 9 ins.; pp. xix. + 427. $3.

Dr. Oliver has written a book which contains much information of interest and value to engineers and contractors. The volume should also make a strong appeal to broadminded employers or directors of labor in the various trades and industries; workers in distinctively health-protective fields, like members and executive officials of health boards; physicians and surgeons whose private or hospital practice brings industrial workers before them; legislators charged with making and revising laws for the protection of men and women engaged in shops, factories, and mines; and humanitarians in general.

The opening chapter is a general review of "Factors Contributing to Industrial Diseases and Accident." The very first sentence will arouse the interest of employers of labor, for in it the author points out the necessity of bringing home to the workers themselves "the dangers incidental to particular tables." The author continues:

> There must be a greater amount of mutual trust and a heartier co-operation of employers and employed. Only thus is it possible to remove the stigma that attaches to many occupations and the cause of their unhealthiness. No person should be employed in a dangerous trade until the risks have been explained to him by the employers and the means indicated whereby danger to health may be averted. Of the conditions met with in factories that contribute to industrial diseases mention may be made of imperfect ventilation, absence of means for the withdrawal of dust, imperfect supervision of the workers, and inadequacy of washing appliances. Want of cleanliness has long been recognized as an important contributing factor, especially when combined with poverty, deficient food and clothing, and improper housing. Sex is in some instances a predisposing circumstance, as, for example, in the greater liability of women to plumbism and to the rarer types of the malady than men. Age, too, is not without its influence, for experience has shown that young adults of both sexes are more predisposed to lead poisoning than persons of maturer years. The bad effects of overcrowding and of sleeping in ill-ventilated rooms are seen in the readiness with which fatigue is induced and in the inability of workers thus imperfectly housed to keep pace wth their healthier comrades and the increased speed at which machinery is run. It is largely owing to the influence of fatigue that, as the day proceeds, the workers, becoming tired in mind and body, become careless, and as a consequence the number of accidents increases with the hours of toil.
>
> As a result of general fatigue, the exhausted and overheated workman, on leaving the factory, is less resistant to the weather, and readily catches cold. In a similar manner groups of overworked muscles readily became paralyzed, compared with other muscles that are not co constantly in action. Knowing this fact, house-painters, by educating themselves to use both hands, become less liable to "wrist drop." There are certain people, the victims of an inherited weakness of the nervous system, the subjects of neurasthenia, others again the subjects of anaemia or bloodlessness, who, through sheer physical inability, are unable to do an ordinary amount of work and who are more quickly laid aside by industrial disease than others. Where the work is hard, and heavy weights have to be lifted or carried, the effect of such strain may show itself in rupture of a blood-vessel, the formation of an aneurism, dilatation of the heart, rupture of muscle, strained tendon, or hernia. The habits of workpeople, too, are not without an important bearing upon their freedom from or their liability to industrial diseases. There is nothing that induces to certain forms of industrial poisoning or is more likely to become a cause of accident to a workman than indulgence in alcohol. An intemperate man is only courting disaster when he continues to work, for example, in a white lead factory. Apart from the imperfect character of the workmanship, the excessive use of alcohol makes a man careless and heedless of danger; he runs risks he otherwise would not incur, and to this circumstance may be traced many of the accidents that happen in docks and wharves, and to it, also, probably some of the shipwrecks that have taken place shortly after vessels have put to sea. The excessive use of alcohol is a cause of epileptic attacks in men previously free from fits, and as epilepsy assumes many forms—for example, often only a sense of giddiness or faintness—it is not improbable that some of the unexplained falls of men which result in serious injury to life and limb, may be the result of ill-nourished, poisoned conditions of the nervous system, not the outcome of an immediate debauch, but of long-continued indulgence in alcohol. If we add to alcohol the infection of syphilis we have in these a combination of circumstances the influence of which, from a medico-legal point of view, is far reaching so far as workmen's compensation is concerned.
>
> It is an interesting problem to consider the probable effects upon the health of the workpeople in the future of the increased speed at which machinery is being run in the factories and the speeding-up of the work in shipyards. * * * There is a limit beyond which the speeding of machinery cannot be run without detriment to the health of the operators unless their hours of work are materially shortened.
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>
> To protect against excessive fatigue we should encourage regular and temperate habits on the part of the workpeople, personal cleanliness, the use of good food, sleeping in well-ventilated rooms, and the avoidance of overcrowding as far as possible. It is difficult, if not impossible, for the poorer working classes, living as they often do in the slums of large towns, to observe and obtain these. If we cannot control the hygienic conditions of the homes of the working classes, we can at any rate insist that in the factory and workshop the conditions under which work is carried on shall be as healthy as possible, that means shall be in use to carry away dust, that the temperature and humidity shall not be too high, and that the air shall contain even less carbon dioxide than is allowed by law. If employers wish to have tidy and clean workmen they must keep their factory clean. Change of clothing after working has a refreshing effect upon most people, and workmen who have washed in the factory and changed their clothing will probably make a better meal on reaching home than the unwashed workman.

This whole chapter abounds with suggestions which show the author's intimate knowledge and full appreciation of the various phases of his many-sided subject—a knowledge which he as gained by living and practicing his profession in an industrial community (Newcastle-on-Tyne) and by serving on various governmental commissions having to do with dangerous trades.

Without attempting to enumerate the full contents of the volume, we may say that the author takes up diseases to due gases, vapors, high temperatures, organic and inorganic dust, overheated atmospheres, metallic poisons and the like.

Engineering readers will be particularly interested in the twenty-five pages devoted to "Diseases Due to Working in Caissons and Compressed Air," the forty-five pages on "Mining," and the brief chapters on "Explosives" and "Diminished Atmospheric Pressure," and the chapter on "Diseases Due to Parasites and Micro-Organisms."

The following extracts from the last-named chapter are given because of their interest to engineers and as a further illustration of the author's method:

> It was during the tunneling of the St. Gothard in 1892 for railway purposes that European nations first came to realize what a power for harm ankylostomiasis can be. During one year when engineering operations were in progress at the St. Gothard, there were registered between Oct. 1, 1880, and Sept. 30, following, 186 cases of anaemia in miners. The making of the tunnel was attended by a loss of life, human and equine, which was appalling. Many of the miners were seen to become pale, to suffer from shortness of breath on exertion, their feet to swell so that the men became unable to walk, and as the illness assumed endemic proportions and had not been observed previously to any extent in Europe, the malady, since it was thought to be the consequence of men working in tunnels, came to be called "maladie des tonnelles." As pallor of the body was one of its most striking features, it was also known as "miners' anaemia." * * *
>
> It was reserved to Dr. Parroncito, of Turin, to discover and point out the real cause of the malady. On making a post-mortem examination of the body of deceased miners, he found numerous small white threadlike worms in the upper part of the small intestine and adherent to its lining membrane. When the parasite was examined microscopically, it was recognized as the worm described by Dubini, of Milan, in 1838, and further as the same parasite which affects the fellaheen of Egypt, causing Egyptian chlorosis, and the field laborers of India, Ceylon, Assam, South America, Australia, etc. The malady was not therefore, as was at first thought, a new disease. As far back as 3,450 years ago there appears in a medical papyrus an accurate description of the symptoms exhibited by a person who is suffering from ankylostomiasis. In the United States of America the disease has been regarded as the result of mud or earth eating, especially among the poor white people and the negroes who live along the banks of the Roanoke River in North Carolina. It was found years ago among the slaves of Louisiana, and attributed to the same cause. * * *
>
> Since ankylostomiasis affects field laborers who are working in the glare of a warm sun equally as well as the Italian miners in the gloom of the St. Gothard, it is apparent that the disease must be due to other than subterranean causes. Perroncito settled the point so far as mining is concerned. It was by utilizing the knowledge supplied by him and others, also owing to the special care taken of the miners by the medical men that the engineers were able to make and complete the Simplon Tunnel, which is three miles longer than the St. Gothard, without any cases of ankylostomiasis appearing amongst the miners.
>
> On the completion of the St. Gothard tunnel there were set free large numbers of Italian miners who, in order to obtain employment elsewhere, traveled far and wide to the various mining districts of Central Europe. A few years afterwards ankylostomiasis broke out unexpectedly in the coal-bearing districts of Hungary, Germany, and Belgium, and as the disease assumed alarming proportions it called forth the united efforts of the mining authorities and the medical profession to cope with the ravages of the endemic. While this was occurring on the Continent, considerable uneasiness was created in our own country by the discovery of the disease among the tin-miners of Cornwall. The manager of the Dolcoath mine had observed that several of the miners were suffering from debility, anaemia, and oedema of the feet, and were unable to follow their occupation. He attributed the ill-health of the miners to imperfect ventilation of the mine, but on microscopical examination of the faeces, the oval of the ankylostoma were found therein. The malady had, therefore, silently gained an entrée into the tin-mines of Cornwall: it was the same disease as that which proved so destructive to the miners in Westphalia and Hungary.

As to precautionary measures the author says, in part:

> TREATMENT OF ANKYLOSTOMIASIS.—The treatment of this disease is preventive and curative. As the presence of one infected careless workman in a mine may be followed by infection of that mine, experience has shown the desirability of mine-owners getting made for them a microscopical examination of the faeces of suspected miners and of men who have come from an infected district.
>
> * * * * * * *
>
> Water-closets should be provided for the men at the pit mouth, and their use encouraged. In infected mines portable dry closets or covered iron pails should be provided for the use of the men working underground. The deposition of faeces by the men elsewhere than in the receptacles provided for this purpose should be made penal. The pails or receptacles should be taken out of the mine daily, rinsed with boiling water and thoroughly disinfected. The miners should wash their hands well before eating. Instruction should be given to the workmen upon the life-history of the parasite, so as to secure their intelligent co-operation. Fresh miners, who have worked in tropical or mid-European countries, on applying for employment in British mines should have their faeces microscopically examined before being accepted. Free ventilation of the pits and a cool temperature therein are aids to prevention.

Throughout the volume the author shows a great breadth of view, but this is tempered with an appreciation of the difficulties to be met with in getting manufacturers to change or abandon long-established industrial processes and the equally great difficulties involved in changing the habits of workmen.

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cussing British conditions, do not yet exist in this country, namely, those connected with the Workmen's Compensation Act. But Employers' Liability, payment of damages for accidents to workmen, has been much to the front here of late, and is only a matter of long-delayed justice, which is bound to come sooner rather than later. When it does come, our captains of industry will receive fresh stimulus to safeguard their workmen from the predisposing causes of disease and from accident.

◆

Civics and Health.

CIVICS AND HEALTH.—By William H. Allen, Secretary, Bureau of Municipal Research, Author of "Rural Sanitary Administration in Pennsylvania," etc. With an Introduction by William T. Sedgwick, Professor of Biology in the Massachusetts Institute of Technology. Boston and New York: Ginn & Co. Cloth; 5 × 8 ins.; pp. 411; plates and text illustrations. $1.25; by mail, $1.40.

Although health and civics are here used in a broad sense and many health problems are touched upon at least lightly, yet the greater part of the book is devoted to the health of the school child. Two chapter headings may be taken to indicate more particularly the viewpoint of the author throughout. These are "Health a Civic Obligation" and "The Best Index to Community Health is the Physical Welfare of School Children." This involves medical and physical examination of school children, and in addition follow-up work to see that such physical defects as mouth breathing or adenoids, eye strain, bad health, bad teeth and unclean mouths, and nervous diseases, after discovery by inspection, shall be remedied by either private or public means.

The author would not stop with the school child. He lays stress upon the importance of having youths of both sexes pass a satisfactory physical and medical examination before they are given the "working papers" necessary in the more progressive states before children are allowed to enter shops, factories or stores. The object of such examinations would be to prevent those who were physically unfit, or who would be a menace to the health of others, from going to work, and to direct those in ill health or deficient strength to lines of work best suited to their condition. The author would go still farther. He urges that the employees of industrial establishments generally should be examined at intervals for the same general purpose as has just been indicated in the case of school children.

Besides the subjects already mentioned, the book contains chapters on "Industrial Hygiene," "The Last Days of Tuberculosis," "The Fight for Clean Milk," and on a number of other topics more or less distinct from school hygiene and medical and school inspection.

The book is divided into five parts, each of which contains from four to eleven chapters. The titles to the five parts are as follows: "Health Rights;" "Reading the Index to Health Rights;" "Cooperation in Meeting Health Obligations;" "Official Machinery for Enforcing Health Rights;" and "Alliance of Hygiene, Patriotism and Religion." Although nearly everything the author says is valuable and needs to be brought home to some hundreds of thousands of people throughout the country, yet we cannot but feel that his book would have gained in force and usefulness if he had condensed it materially. An introductory chapter is particularly needful, the brief introduction by Prof. Wm. T. Sedgwick being a well-deserved Appreciation rather than an Introduction.

There is nothing in the way of introduction or conclusion to outline the general plan of the author, nor to give his viewpoint, nor to explain why a book with so broad a title should be confined, for the most part, to so small a portion of the field indicated by the title. The author plunges at once into some remarks on the obligatory "teaching of hygiene with special reference to alcohol and tobacco" in 45 states and territories. He characterizes much of this teaching as perfunctory, but it is not until toward the close of the book that the uninformed will realize that teaching hygiene in the public schools is largely a farce because it has been forced into the curriculum by the extreme advocates of temperance reform. We do not wish to belittle the interest and value of the book, but merely to point out how both might have been increased. This we have the less hesitancy in doing since the author is Secretary of the Bureau of Municipal Research, whose watchword and very reason for existence is efficiency.

We wish to call particular attention to the contrast which the author draws between the policy, on the part of those responsible for public health, of "doing things" and "getting things done." In this discussion, as in most others throughout the book, the author is referring more particularly to looking after the health of school children, but the principle is applied by the author to other lines of health work, and might well be taken to heart by all municipal departments.

◆

Underground Cables for High Tension Currents.

HIGH-TENSION UNDERGROUND ELECTRIC CABLES.—A Practical Treatise for Engineers. By Henry Floy, M. Am. Inst. E. E., Author of "The Colorado Springs Lighting Controversy," etc. New York: Electrical Publishing Co., 165 Broadway. Cloth; 5 × 7½ ins.; pp. 135; four text illustrations and one plate. $2.

Mr. Floy has built up this book from a series of papers contributed to the "Electric World" in the fall of 1908. The book summarizes experience and gives data based on the practice of many engineers who have been responsible for the installation and maintenance of high-tension, underground, power-transmission lines. The argument of the book is that service by cable is more reliable than by aerial conductors and that the cost is often so low as to make the installation of cables economical in many locations where they are not demanded.

The book is clearly written and well arranged. The type is large and easily read. The liberal use of captions and side heads facilitates reference. Statements not made on the authority of the author alone, show their source so that the way for further study of specific instances is open to the reader.

After some 25 pages of general and historical matter, a table is given of 35 prominent installations in America, showing the essential facts about each. The author explains the great differences shown in the practice of different companies by (1) the different dielectric value of the several insulating materials used; (2) ignorance of the minimum amounts of insulation and of factors of safety or the higher voltages; and (3) by the fact that there is apparently less abnormal electrical disturbance and stress in the higher-tension lines than in the lower.

There is a long chapter on the insulating materials used in cable manufacture—rubbers, papers and cambrics. The methods of manufacture and the requirements for various services are briefly set forth. The thickness of insulation for various sizes and services is shown by tables of several manufacturers. This chapter is followed by one on the metals used in cable making, both as conductors and sheaths. Here the author maintains that, with the cheapening of aluminum, cables with aluminum conductors are now some 15% cheaper than those using copper, notwithstanding the smaller diameter of the latter.

In a chapter on the heating of power cables the author shows how, in all but the smallest sizes, current-carrying capacity is limited by the heat-radiating surface of the conductor and by the effect of temperature rise and not by the maximum permissible voltage drop.

Toward the end of the volume, formulas for the electrical properties of cables are given with tabulated values of some of these quantities for various types and installations of cable. There is also a short chapter on testing methods and one on the comparative cost of rubber, paper and cambric cables.

◆

THE SOIL.—An Introduction to the Scientific Study of the Growth of Crops. By A. D. Hall, Director of the Rothamsted Station (Lawes Agricultural Trust). Second edition, revised and enlarged. New York: E. P. Dutton & Co. Cloth; 5¼ × 8¼ ins.; pp. 311; 17 illustrations, partly in the text. $1.50, net.

While primarily intended for agricultural students and progressive farmers, this volume con-

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tains much information on the analysis, texture, temperature and bacteria of the soil which will be of interest and value to all those who have occasion to go into those subjects for engineering or other reasons. From the agricultural viewpoint, the book seems to be comprehensive and thorough. Naturally, most of the statistical and other reference matter is drawn from British sources, but throughout frequent reference is made to American records and writers. A similar but earlier American book is Prof. F. H. King's "The Soil." The same American author has written a book on "Irrigation and Drainage," in which he takes up in detail phases of the soil and their amelioration which are, necessarily, treated but briefly in the more general works on "The Soil."

◆

How to Get a State Medicine Degree or a Diploma of Public Health.

ESSENTIALS OF SANITARY SCIENCE.—By Gilbert E. Brooke, M. A. Cantab.; L. R. C. P. Edin; D. P. H.; F. R. G. S., Fell. of the Royal Institute of Public Health; Port Health Officer, Singapore; Author of "A Hygiene Reader for Schools," etc. London: Henry Kimpton. Cloth; 5 × 7½ ins.; pp. 413; 62 text figures. 6s., net. American price, $2.40.

In England and the United Kingdom generally, the right to append the three letters D. P. H. to ones name is quite generally considered a requisite to a candidate for at least the leading positions filled by municipal health officers, or medical officers of health, as the term is there. The primary aim of the book before us is to present in one relatively small volume all that the student needs when he is making his final preparations for the four-day examination which he must pass to obtain a diploma of public health. We say "final studies," because according to this book it appears that "candidates for registrable diplomas and degrees in State Medicine" are required by the General Medical Council to first take a degree from a medical school; then spend at least six months in a chemical, bacteriological and pathological laboratory; then work for six months under a medical officer of health, and three months in a hospital for infectious diseases, where there are chances to study administration. Three months of the work in the laboratory and under a medical officer of health may overlap, thus cutting to twelve months the period and work which must intervene between the medical degree and the examination for the public health diploma. Three years' service as a medical officer of health of a sanitary district of not less than 15,000 population, somewhere in the British dominions, is accepted as a substitute for the service in a laboratory and under a medical officer of health.

The author expresses the hope that his work will be "useful to all sanitary officers and medical officers of the Public Services," and that it will "be as useful and indispensable in the laboratory as it is in the study."

Besides the subjects one would expect to find treated in a volume having the design just set forth, the book contains chapters on hydrostatics, pneumatics, heat and geology. These are very condensed, consisting chiefly of definitions of terms and citations of physical laws, the latter frequently accompanied by brief proofs. There are also descriptions of physical apparatus, such as thermometers, barometers and rain gages. As one would expect, meteorology, air, water, food, analytic work of various kinds, disinfection, bacteriology and parasitology are treated. There are also chapters on personal and school hygiene, sanitary architecture and engineering, wastes disposal, epidemiology and endemiology, vital statistics, sanitary law and administration.

Perhaps the most interesting and instructive part of the book for Americans is the appendix. It is here stated that "candidates wishing to obtain special qualifications in public health may do so by either obtaining a degree or a diploma." The "chief degrees" in State Medicine granted by a number of British and Indian universities are given, together with a list of universities and examining boards in England, Scotland and Ireland which grant diplomas of public health. The prerequisites to examinations for diplomas and degrees in State Medicine are stated in the appendix. In addition, there are given sample examination papers for the London M. D. (State Medicine); the Edinburgh B. Sc. (Public Health); the Durham B. Hy., and also for D. P. H. (Scottish Conjoint). These examination papers indicate why the author considers it necessary to include chapters on such subjects as physics and geology.

For our part, we must confess that we cannot see how the ability of the future health officer to control the spread of diseases and build up the general health of the community in his charge is indicated by his ability or inability to

> give the petrographical characters of Basalt, Porphyrite, Gneiss, Chloriteschist, Quartzite, Dolomite, Chalk, Greywacke and Marble, [or to] draw a section or sections to illustrate the following structures—Anticline, Syncline, Unconformity, Fault, Dyke,

as required in the Edinburgh examination papers.

As might be expected in a book designed primarily and chiefly to aid candidates to secure a degree or diploma certifying to the possession of special qualifications to serve as a medical officer of health in Great Britain, the book is insular in character. Perhaps the most notable instance of this is the statement that

> 10 to 20% of Medway Valley clay constitutes Portland cement.

Perhaps the author intended to make amends for such provincialism (as we should suppose this to be) by the following statement:

> Many of the North American houses, especially in out-of-the-way places, are made of wood; and this material is also largely used in the tropics.

Surely the first part of this statement would amuse, if it ever came to their attention, the millions of people in the United States and Canada who live in houses built of wood. It happens that the writer of this notice lives in one of these *out-of-the-way places* (15 miles from New York City), which, with a population of 20,000, contains, as do most of the suburbs of New York City, scarcely a house not built wholly of wood above the foundations.

The foregoing paragraph is, of course, intended as a diversion rather than a serious criticism.

Minor criticism may be made of the author's statements regarding the use of lime in sewage treatment at Birmingham, England, and his description of the treatment of sewage by "Electrolysis." Lime was given up at Birmingham some years ago and the electrical treatment of sewage which he describes never came into practical use. Under "Aerobic bacteriolysis" the author makes the surprising statement that "a layer of sand covers" the underdrains of coke filters, and that above the coke is another layer of sand.

Serious criticism of the book should be directed rather to the fact that it is devoted almost wholly to laws and rules, and pays but scant attention to the spirit, or gospel, of sanitation. Perhaps this is largely unavoidable in a book with the objects of this one, but we think that at least a brief chapter could be very advantageously devoted to the "why," when so much space is given to the "how" of sanitation. Had the author undertaken such a chapter, and done his preparatory work for it with the same thoroughness evidenced in his chapter devoted to definitions and practice, we believe he would have been tempted to discard a considerable portion of the latter and to expand his exposition of the real essentials of sanitary science—with which many pages of this volume really have little or nothing to do. It is hard to understand, for instance, why the volume should contain so much on pneumatics, hydrostatics and geology, and not a word on the essentials of the production, transportation and delivery of clean, disease-germ-free milk. Notwithstanding this criticism, the author is certainly to be most heartily commended for the immense amount of painstaking work which he has done in condens-

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ing such vast mass of information, the greater part of which is certainly very essential to a good sanitation and effective health-protective work, and all which may, perhaps, be required by those who have to face the rigid and extensive examinations set before British candidates for the degree of State Medicine or for the Diploma of Public Health.

◆

RAILWAY OPERATING ASSOCIATIONS.—Address Delivered before the Graduate School of Business Administration of Harvard University, Jan. 11, 1909, by W. H. Allen, Secretary, The American Railway Association (24 Park Place, New York City). Paper; 6 × 9 ins.; pp. 28.

A very interesting and readable history of railway officers' associations in the United States is presented in this pamphlet. It would be difficult to overestimate the benefits to the public which have resulted from the work done by these voluntary associations of railway officers. It may be added that a large amount of credit for the development of the most important of these organizations, the American Railway Association, is due to its efficient Secretary, Mr. W. H. Allen, the writer of this pamphlet.

◆

THE CARD SYSTEM AT THE OFFICE.—By J. Kaiser, Librarian of the Tariff Commission. North Finchley, England: The Author (Hazelwood). Stiff paper; 6 × 9½ ins.; plates. 5s., net; American price, $2.

Suffering the fate of all moderately good innovations, the "systematizing" of business is being run into the ground. Because, in truth, it has some sound and reasonable basis which is recognized by all business men there are bound to spring up exploiters who utilize this recognition to develop cumbersome schemes of infinite variety which, they claim, will bring highly desirable order out of the previous chaos of the business office. At first glance, this book of Mr. Kaiser's seems to belong to the class of systematizing to be avoided. Closer reading shows that this seeming fault is due to the text-book nature of the work, which demands a complete treatment.

One thing is certain; if the multiplicity of indices, the interweaving of cross-references, the almost interminable repetition of cards, recommended by the book were adopted by a business house, its offices would be cluttered with cabinets and files and its working employees and officers would not be found in the crowd of indexers and filers. And to pay for the up-keep of the "system" would take the best efforts of the concern. But there are many admirable suggestions in the book which, if carefully adopted, should be of valuable assistance to any office manager.

The present volume is the first of a series of three. Vol. I., according to the preface, gives sufficient information on which to construct indexes generally required in an office. Vol. II. will be almost entirely devoted to the work of indexing in the sense of analyzing literature and will go more fully into the question of classification and the management of guide cards. Tabulated cards, methods of tabulating and the application of tabulated cards to practical business will be dealt with in Vol. III., to be entitled "The Card System in the Factory."

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Publications Received.

AMERICAN MINING CONGRESS.—Report of Proceedings, 11th Annual Session, Pittsburg, Pa., Dec. 2-5, 1908. Denver, Colo.: The Congress (James F. Callbreath, Jr., Secy.). Stiff paper; 6 × 9 ins.; pp. 268; illustrated.

AMERICAN SOCIETY OF MUNICIPAL IMPROVEMENTS.—Proceedings of the Annual Convention Held at Atlantic City, N. J., Oct. 20-23, 1908. (A. Prescott Folwell, Secy., New York City.) Paper; 5¾ × 8¾ ins.; pp. 318; folding and other plates, and text illustrations.

BOILER FEED WATER.—A Practical Treatise on Its Quality, Effects and Purification. By Fred. A. Anderson, B. Sc. (Lond.), F. I. C., F. C. S. London, England: "The Electrician" Printing and Publishing Co., Ltd. New York: The D. Van Nostrand Co. Cloth; 5¼ × 8½ ins.; pp. 160. $2.50, net.

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